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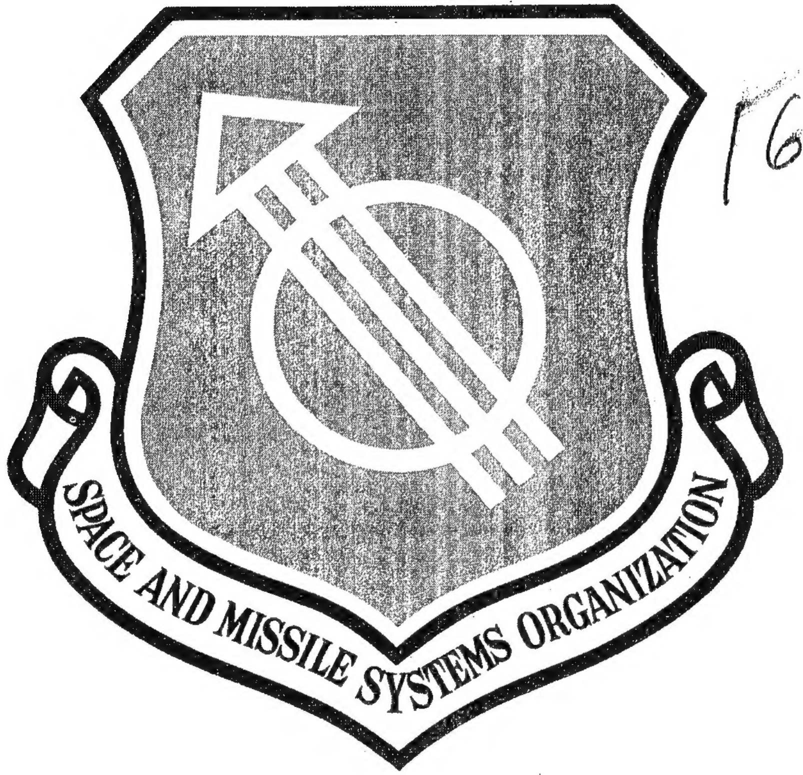
DOCUMENT HISTORY OF AGENA


SPACE AND MISSILE SYSTEMS ORGANIZATION

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Prepared by

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November 1971

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1. Msg (C/Gp3), from Comdr, WDD to CofS, Cite WDTR 3-3-E, 16 Mar 57.

2. Ltr (S/RD), from WDD (WDTR) to MajGen D. J. Keirn, no subj, 8 Apr 57.

3. Ltr, from WDD (WDTR) to Lockheed Aircraft Corp, subj: AFBMD Policy Review of LAC/MSD Report 35804 "General Test Plan and Related Facilities and Equipment," 23 Sep 57.

4. DF (C/Gp3), from MCPTA tp MCPT, subj: Weekly Diary - 4 thru 10 Oct 57, 10 Oct 57.

5. Memo for the File from MCPTA, subj: Letter Contract AF 04(647)-97 - Lockheed Aircraft Corporation - Amendment #6, 11 Oct 57.

6. Memorandum for Col Terhune (C/Gp3), from WDTR, sgd Col Frederic C. E. Oder, subj: WS 117L Guidance and Control, 14 Feb 57.

7. Memorandum for Col Oder from WDTS, signed Col Harry L. Evans, subj: Guidance and Control for WS 117L, 29 Mar 57.

8. Msg (C/Gp3) from Lockheed MSD Palo Alto, to Comdr AFBMD, subj: L/C Contract AF 04(647)-181, Proposed Development for Short-Term Improvement of New Horizon Propulsion Subsystem, Cite LMSD 56167, 2 Apr 58.

9. Msg, from Comdr ARDC to Comdr AFBMD, Cite RDZGW 7-4-E, 031945Z.

10. ARPA Order No. 17-59, 4 Sep 58.

11. ARPA Order No. 17-59, Amendment No. 1, 29 Sep 58.

12. ARPA Order No. 17-59, Amendment No. 2, 17 Oct 58.

13. ARPA Order No. 17-59, Amendment No. 3, 26 Nov 58.

14. Navy Msg to Comdr, WADC, subj: Engine Designation; confirmation of, 11 Dec 58.

15. WADC Ltr, to Hq ARDC, subj: Model Designation for WS-117L Engine, 9 Jan 59.

16. DF from WDZWS to LBJ, subj: Request for CCN for Contract AF 04(647)-97, 15 Jan 59.

17. Deleted.

18. Ltr from BMC(LBJ), subj: Back-up Photovoltaic APU Design, 20 Jan 59.

19. Msg from MSD, Sunnyvale to BMC, 21 Jan 59.

20. Ltr from Lockheed Aircraft Corp to Comdr, Hq BMC, subj: Contract No. AF 04(647)-97, Back-up Photovoltaic APU Design, 2 Feb 59.

21. Msg from Comdr, AFBMD to Director, ARPA, 9 Feb 59.

22. Memorandum for Col Curtin from WDZWS, subj: Photovoltaic Solar Cell Research, 16 Feb 59.

23. Memorandum for LtCol Battle from WDZW, subj: Dual Burn Engine Capability, 6 Mar 59.

24. Ltr (S/RD), AFBMD (WDZW) to MajGen D. J. Keirn, no subj: 9 Mar 59.

25. ARPA Order No. 17-59, Amendment No. 4, 10 Apr 59.

26. ARPA Order No. 17-59, Amendment No. 5, 13 Apr 59.

27. Ltr, Lockheed Aircraft Corp to Comdr AFBMD, subj: Analytic and Stability Studies of WS 117L Flight Control Section.

28. Ltr from Lockheed Aircraft Corp to Comdr, AFBMD, subj: Contract AF 04(647)-97 Solar APA Backup Program, 2 May 59.

29. Msg (C/Gp3) from Lockheed to LBJP E. S. Silberman, subj: Amendments to CCN No. 23, 6 May 59.

30. ARPA Order No. 17-59, Amendment No. 6, 18 May 59.

31. WDZ Memorandum for multiple addresses, subj: ARPA Order 17-59 (as amended), 18 May 59.

32. Ltr from AFBMD (WDTIM) to LBER, subj: Letter Contract Supplemental Agreement 35 to Contract AF 04(645)-65, Closed Loop Propellant Utilization System, 4 Jun 59.

33. AFBMD report, subj: Transit II Program Progress Report for May 1959, 8 Jun 59.

34. Para 4, Weekly Diary - 11 thru 18 June 59 from BMC (LBJ), 18 Jun 59.

35. ARPA Order No. 17-60, Amendment No. 8, Project Code No: as indicated below, 1 Jul 59.

36. ARPA Order No. 96-60, Project Code No. 3600, 1 Jul 59.

37. AFBMD Report, subj: TRANSIT II Program Progress Report for 30 Jun 59.

38. Msg from Lockheed to Comdr AFBMD, subj: Improving Model 8048 Engine Performance, 28 Jul 59.

39. WDZE Ltr to LBJ, Mr. Silberman, subj: Performance Improvement of LR81-Ba-5 Engine, 31 Jul 59.

40. AFBMD Report, subj: Modification of AGENA Vehicle, 7 Aug 59.

41. Msg from Comdr to AFSWC, 7 Aug 59.

42. Ltr from Lockheed to Comdr, AFBMD, subj: Contract No. AF 04(647)-347, Flight Termination System Atlas Boosted Vehicles, 10 Aug 59.

43. Ltr from WDZEV to WDZSM (Maj Callan), subj: Minutes of MIDAS FTWG Flight Operations Subcommittee, 29 Jun 59, 13 Aug 59.

44. Ltr from WDZEV to WDTCS (LtCol Salzer), subj: Flight Termination System of Atlas Boosters, 18 Aug 59.

45. AFBMD report, subj: Modification of AGENA Vehicle, 31 Aug 59, 8 Sep 59.

46. Ltr WDZEA to WDZSD, subj: Discoverer Capsule Batteries, 10 Sep 59.

47. Ltr from WDZEG to WDZET (Capt Van Dusen), subj: STL Plan 165-41, Study of Attitude Sensors for Space Missions, 17 Sep 59.

48. AFBMD (WDZSM) ltr to WDZE, subj: Recommendations of LMSD-CVAC Vehicle-Booster Configuration Meeting, 26 Sep 59.

48a. MFR from Col Frederic C. E. Oder, subj: Discoverer/SAMOS/MIDAS/COMSAT/AGENA Confiburations, 29 Sep 59.

49. AFBMD report, subj: Modification of AGENA Vehicle, 30 Sep 59, 1 Oct 59.

50. Msg from AFBMD to Lockheed, Cite WDZE 10-5-E, 5 Oct 59.(C/Gp3)

51. Msg, Cite WDZE-10-10-E, 9 Oct 59.

52. Msg CITE WDZE-10-9-E, 9 Oct 59.

53. ARPA Order No. 96-60, Amendment No. 1, Project Code No. 3600, 15 Oct 59.

54. Ltr (Uncl w/o C/Gp3 atch) from WDZEV to WDPCR, subj: Space Programs Status Report, 15 Oct 59, w/1 Atch.

55. Ltr (C/Gp3) from WDZEV to WDZD (Col Evans), subj: Discoverer, MIDAS, Samos, and Comm Sat (Steer) Configuration and Schedule, 16 Oct 59, w/2 Atch: 1. Chart, Space Systems Progress; 2. 4 charts, Configurations, #1 - 4, 4th chart CONFIDENTIAL, Gp3.

56. AFBMD report, subj: Modification of AGENA Vehicle, 31 Oct 59, 9 Nov 59.

57. Ltr from WDZER to WDZS, subj: Discoverer/Samos/Midas/Comsat/Agena Configurations, 13 Nov 59.

58. Ltr from WDZS to WDZE, subj: Discoverer/Samos/Midas/Comsat/Agena Configurations, 17 Nov 59.

59. ARPA Order No. 96-60, Amendment No. 2, Project Code No. 3600, 3 Dec 59.

60. Ltr from AFFTC to AFBMD, subj: Engine Model Designations, 18 Dec 59.

61. AFBMD report, subj: Modification of AGENA Vehicle, 30 Nov 59, 22 Dec 59.

62. Ltr from AFBMD Field Office, WDGEV-6, to Comdr AFBMD, subj: Procedure for Coordination of Discoverer Engineering Approvals, 5 Jan 60, w/1 Atch: Report, Subj: Procedure for Coordinating Approvals on Engineering Modifications to Agena Vehicles at Lockheeds Facility at Vandenberg AFB.

63. Ltr from WDZNE to WDZY, subj: Control of Agena Vehicle Changes following AF Acceptance, 19 Jan 60.

64. AFBMD report, (C/Gp3), subj: AGENA Program Progress Report as of 31 Jan 60, 12 Feb 60.

65. Ltr (C/Gp4) from AFDRD to ARDC (RDR), subj: Augmentation of Propulsion Program, 23 Feb 60.

66. Msg, Cite AFDDP 73993, 27 Dec 60.

67. Ltr from Lockheed to AFBMD (WDZRE), subj: Standardization Provisions in the Agena Configurations - Interim Report, 4 Mar 60.

68. Msg (S/Gp3) from Lockheed to AFBMD, Cite LMSD 354768, 8 Mar 60.

69. AFBMD report (C/Gp4), subj: AGENA Program Progress Report as of 29 Feb 60, 8 Mar 60.

70. AFBMD Ltr (Uncl w/o Conf/Gp3 Indorsement) to WDZN, subj: Reliability Testing of Agena Subsystems by Air Force Agencies, 9 Mar 60, w/1st Ind, same subj, 5 Apr 60.

71. Ltr (Uncl w/o C/Gp4 Atch), sgd D. N. Murphy, Contracting Officer, to Comdr ARDC, subj: NASA Order No. S-4601-C, 23 Mar 60, w/atch: Statement of Task, w/1 (C) Atch, NASA Agena Launch Schedule.

72. AFBMD (WDZT-1) Ltr to multiple address, subj: Agena Vehicle Captive Test Program, 11 Apr 60.

73. AFBMD Daily Bulletin No. 71, 12 Apr 60.

74. NASA Agena B Program, MSFC and AFBMD Management Relationships, 14 Apr 60.

75. AFBMD report (C/Gp4), AGENA Program Progress Report as of 30 April 1960, 6 May 60.

76. AFBMC ltr (C/Gp4), subj: Assignment of Thor Vehicles to the NASA Agena B Program, 12 May 60.

77. AFBMD ltr (C/Gp4) to Hq ARDC, subj: General Schriever's Appearance before Johnson Committee, 9 June 1960, 2 Jun 60.

78. WDZY-2 ltr to Lockheed Missiles & Space Division, subj: Improvement of Agena Flight Preparation Procedures, 13 Jun 60.

79. WDZ ltr to ARDC (RDG), subj: Management Relations with the NASA Concerning the NASA Agena B Program, 16 Jul 60.

80. WDZ ltr to ARDC (RDGN), subj: NASA Agena B Program, 16 Jul 60.

81. AFBMD (WDG-16) ltr to WDZD (Col Evans), subj: Agena Checkout Philosophy, 9 Sep 60.

82. WDRA ltr to WDG-16, subj: Agena Checkout Philosophy, 19 Sep 60.

83. AFBMD (WDRSS) Ltr (S/Gp3) to ARDC (RDRB), subj: Request for Study--Atlas-Agena's Launch from AMR, 19 Sep 60.

84. AFBMD (WDZY-1) ltr to WDZYD (Col Battle), subj: Test Criteria, 22 Sep 60, w/1 Atch, Ltr, LMSD/368772, w/atch.

85. WDG ltr to WDZ, subj: NASA Agena B Schedule, 8 Nov 60.

86. BMC (LBZJR) ltr to Lockheed Aircraft Corp, subj: Implementation of New Test Philosophy, DISCOVERER Program, Contract AF 04(647)-558, 18 Nov 60.

87. Historical report of the NASA Agena B Program for 1 Jul to 31 Dec 60.

88. Ltr (S/Gp3) sgd Col Paul J. Heran to LEX (Mr. Gibson), subj: Agena Configuration, 3 Jan 61.

89. BMC (LBZJR) ltr to Lockheed Corp, subj: Implementation of New Test Philosophy Discoverer Program Contract 04(647)-558, 5 Jan 61.

90. Historical Report, (C/Gp4), NASA Agena "B" Program, 17 Jan 61.

91. Msg (C/Gp4) from Hq USAF, cite AFDSD-MS 78828, 191818Z Jan 61.

92. Msg from BMC to LMSD, subj: Contract AF 04(647)-558, Implementation of New Test Philosophy, Discoverer Program, 3 Feb 61.

93. Ltr from BSC (LBZJR) to Lockheed, subj: Make or Buy Structure Satellite Systems Contracts, 13 Feb 61.

94. BMC (LBZJB) ltr to multiple address, subj: Procurement Requirements, 14 Feb 61.

95. National Aeronautics and Space Administration Agena B Launch Vehicle Program - Management Organization and Procedures, 14 Feb 61.

96. AFBMD (WDZ) Ltr to WDRV and WDG, subj: Responsibilities of the Aerospace Corporation, 23 Feb 61.

97. AFBMD (WDZYA) Ltr (Uncl w/o C/Gp4 Atch) to Mr. Robert H. Shatz, subj: Technical Data on the Agena Vehicle, 24 Feb 61, w/1 Atch: Technical Data.

98. SSD (SSZA) ltr to Lockheed, subj: New Test Philosophy Implementation, By-pass of Vandenberg MAB Building, 16 Jun 61.

99. SSD (SSZA) ltr to All SSZA Subsystem Personnel, subj: Discoverer EJA Approval Procedures, 24 Jul 61.

100. Msg (C/Gp4) from SAFS to SSD, info AFSC and DCAS, Cite SAFS 92454, 092008Z Aug 61.

101. SSD (SSZME) ltr to SSE (Dr. Rockefeller), subj: Historical Summary, ARDC/AFSC Support of Army/Navy Space NASA Programs, 9 Aug 61.

102. SSD (SSVR) Ltr (Uncl w/o C/Gp4 Atch), to SSE (Dr Rockefeller), subj Historical Summary, ARDC/AFSC Support of Army Navy Space NASA Programs, 9 Aug 61, w/1 atch

103. Aerospace Corp Ltr to Col H. L. Evans, subj: Standardizing the Agena, 14 Sep 61.

104. SSD (SSZ) ltr to Chiefs of Offices through Branch Level, subj: Development and Utilization of the Agena D, 18 Sep 61.

105. SSD (SSZ) Ltr to Aerospace Corp (Mr. Brewer), subj: Standardized Agena, 18 Sep 61.

106. Asst Secretary of Defense Memorandum for the Asst Secy of AF (R&D), subj: Standardized Agena (C/Gp4), 4 Oct 61.

107. Msg (S/Gp3) from SAFS to SSD, info AFSC and DCAS, Cite SAFS 68264, 062221Z Oct 61.

108. SSD (SSZDK) Ltr to SSKK, subj: Authorization for Type of Contract, 9 Oct 61.

109. Asst Secy of Defense Memorandum for the Asst Secy of AF (R&D) (C/Gp4), subj: Titan III Launch Vehicle Family, 13 Oct 61.

110. AFSC (SCGN) Ltr (C/Gp4) to Comdr SSD, subj: Standardized Agena and Tital III, ca 17 Oct 61.

111. Msg, Cite RWRMP-17-10-19-E, 17 Oct 61.

112. Memo, sgd Brockway McMillan (FOUO), for Asst Secy of Def, ODDR&E, subj: Standardized Agena Program, 24 Oct 61.

113. Study of the Agena "D" by the Johnson Committee (C/Gp4), 25 Oct 61.

114. Active SSZ Contracts, 17 Oct 61.

115. AFSSV ltr (C/Gp4) to AFSC, Subj: Standardized Agens Space Vehicle (Agena D), 26 Oct 61.

116. Agena Office Mission and Organization, Nov 61.

117. DAF Memo for Chief of Staff, subj: Standardized Agena, 3 Nov 61, w/1 Atch: Memorandum for Director, DR&E, 31 Oct 61.

118. SSD (SSZA) Ltr to Col Evans, subj: Items to be Considered when Accelerating the Agena B Schedule, 6 Nov 61.

119. SSD (SSZ) Ltr (S/Gp3), subj: Agena "D," 6 Nov 61.

120. Lockheed ltr to F. W. O'Green, subj: Summary of Instructions Issued by Dr. Charyk in Agena D Meeting of November 7, 1961, 9 Nov 61.

121. Ltr, subj: Organizational Changes and Personnel Reassignments, 13 Nov 61.

122. Ltr to Deputies and Chiefs of Major Staff Offices, subj: Project 662A, 20 Nov 61.

123. Ltr to Deputies and Chiefs of Major Staff Offices, subj: Establishment of Project Office 662A, 20 Nov 61.

124. MFR (Uncl w/o C/Gp4 Atch), subj: Agena D, 20 Nov 61.

125. Msg from Hq USAF to AFSC, info SSD, Cite AFSPM 90799, 222309Z Nov 61.

126. SSD Ltr (C/Gp4) to Lockheed, subj: Agena D Structural Criteria, 24 Nov 61.

127. AFSC (SCGN Ltr (C/Gp4) to SSD, subj: Instructions on Standard Agena D Program, 24 Nov 61.

128. MFR (C/Gp4), subj: Agena "D" Conference, 27 Nov 61, w/1 Atch: Summary of Instructions Issued by Dr. Charyk in Agena D Meeting on November 7, 1961.

129. Memo of Understanding from RWRM (Lockheed AFPRO) to Col Henry B. Kucheman, 28 Nov 61.

130. Msg (C/Gp4) from Hq USAF to AFSC, info SSD, cite AFSDC-F 82530, 301909Z Nov 61.

131. Msg (C/Gp4) from SMON to Lockheed, Sent 30 Nov 61.

132. Msg (S/Gp3) from OSAF to AFSC, info DCAS, cite SAFS 83174, 042206Z Dec 61.

133. Omitted.

134. SSG Ltr to Deputies and Chiefs of Major Staff Offices, subj: Deputy for Agena.

135. SSD (SSZDB) Ltr (C/Gp4) to SSGD, subj: Agena D/DM-21 Interface, 18 Dec 61.

136. SSD (SSGD) Ltr to AFSC (Gen Schriever), subj: Instructions on Standard Agena Program, 18 Dec 61, w/1 Atch: Program 662A Management and Operational Plan, w/6 Atch.

137. Ltr SSX-1 Ltr to SSZ (Lt Col Strathy), subj: Agena D Programming Data, 19 Dec 61.

138. Msg from LMSC, Cite LMSC A071763/62-41/100, 280030Z Dec 61.

139. SSXD Ltr to SSZ, subj: Procurement of Optional Equipment, 28 Dec 61.

140. Msg (C/Gp 4), Cite AFSSV-EQ 90915, 052324Z Jan 62.

141. MFR from SSX, subj: Briefing to Dr. Charyk, 5 Jan 62, (C/Gp4).

142. Ltr (C/Gp4) from SSD (SSXD) to Distribution, subj: Fund Requirements for Program 662A, 11 Jan 62.

143. SSD (SSZDT) Ltr to SSVX (Mrs. Arnold), subj: Sole Source Justification for Complexes 75-3 and 75-1, 18 Jan 62.

144. SSD (SSXDA) Ltr (C/Gp4) to SSZXE (Major Lochry), subj: Agena D Performance Data, 18 Jan 62.

145. SSX MFR, 23 Jan 62.

146. SSX MFR, subj: 18 January - 19 January Agena D Briefing, 24 Jan 62.

147. SSD (SSVXE) Ltr to SSZD (Maj Moore), subj: Additional Instrumentation on Discoverer Flights, 5 Feb 62.

148. SSXD MFR, subj: Discussions with Mr. O'Green and Staff, 13 Feb 62, 14 Feb 62.

149. SSXA Ltr to SSZ, SSB and SSV, subj: Agena D Advanced Component Improvements, 20 Feb 62.

150. MFR, subj: Staff Visit of MajGen Ritland and Mr. Kelly Johnson, 26 Feb 62.

151. Ltr, sgd MajGen O. J. Ritland and Clarence L. Johnson to Gen B. A. Schriever, 27 Feb 62.

152. Msg from AFSC, Cite SCGN-28-2-46, 281927Z Feb 62.

153. Ltr (C/Gp4) from SSXD to SSZ and SSZX, subj: Agena D Weight, 2 Mar 62.

154. Ltr (C/Gp3) from SSXD fo SSZ, subj: Agena D Delivery Schedule 2 Mar 62.

155. Ltr from SSXD, subj: Policy Memorandum - Agena D Optional Equipment Procurement Procedures, 5 Mar 62.

156. Msg Cite SCGN-7-3-12, 071630Z Mar 62.

157. Lockheed Ltr to AFSSD (SSZ), subj: Comparison of Costs - Agena B vs Agena D, 8 Mar 62.

158. SSD (SSVXE)Ltr to SSVR (Maj J. Albert), subj: Study of Thor Agena B Configurations, 12 Mar 62.

159. SSD (SSVXE) Ltr to SSVXK, subj: DM-21 Agena D Pad and AGE Modification, 13 Mar 62.

160. SSD(SSXD) Ltr to SSK, subj: Contract AF 04(693)-68, Request for Authority to Use Form C Price Re-determination, 22 62, (C/Gp4).

161. SSD (SSXD) Ltr to Lockheed, subj: Contract AF 04-695-21 - Incentive Fee Negotiations, 22 Mar 62.

162. WCMR (RWRM) Ltr to MajGen O. J. Ritland, subj: Progress Made in Improvements to LMSC Accounting System, 23 Mar 62.

163. Report (S/Gp3), subj: Space Systems Division USAF Abridged Package 648B - Agena D, 2 Apr 62.

164. Report (S/Gp3), subj: SSD USAF Reimbursable Fund Requirement for 648B-Agena D, 2 Apr 62.

165. SSD (SSH) ltr to BSRP, subj: Requirement for Component Improvement Propulsion Advisory Committee, 2 Apr 62.

166. Negotiated Contract AF 04(695)-21, 6 Apr 62.

167. SSD (SSV) Ltr to DCG (LtGen Estes), subj: Atlas Launches at ARM and PMR, 9 Apr 62, w/1 Atch: Cy ltr from Gen Estes to Gen Ritland, 19 Mar 62, same subject.

168. MFR, subj: Agena D Configuration, 18 Apr 62.

169. Memo for File, subj: Lockheed-Air Force Meeting on Agena D Operational Plan, 25 Apr 62.

170. Ltr, sgd MajGen O. J. Ritland to Gen B. A. Schriever, no subj, 25 Apr 62, w/1 Atch: Ltr, 25 Apr 62, to Comdr AFSC, Rept of 2d Review of Agena D Pgm.

171. SSD (SSH) Ltr to SSS, subj: Attendance at Mockup, CTCI and DEI Boards, 27 Apr 62.

172. SSD (SSH) Ltr to SSGE (Col Berg), subj: SSH (Agena D) Objectives for FY 63, 30 Apr 62.

173. SSD (SSHD) Ltr to SSK, subj: Contract AF 04(695)-68 - Review of 'Make or Buy' Program Pursuant to DCAS AFPI Supplement 2, 9 May 62.

174. MFR, subj: FY-62 Incremental Funding of the Agena D Contracts, 10 May 62.

175. SSD (SSHD) Ltr to Lockheed, subj: Agena D Optional Equipment, 14 May 62.

176. SSD (SSHD) Ltr to SSCM (LtCol Warren), subj: Underfunded Contracts, 14 May 62.

177. MFR, subj: Modernization of Industrial Facilities Bell Aerosystems Company, 16 May 62, w/1 Atch: MFR same subj dtd 15 May 62, w/1 Atch, Cy Msg to LMSC from Bell, no date.

178. SSD (SSH) Ltr to SSHD (LtCol Blum), subj: Technical Support Contract, 21 May 62.

179. NASA ltr to Hon Brockway McMillan, ca 21 May 62.

180. Asst Secy of Defense Memorandum (FOUO) for the Secretary of Defense and NASA, subj: DOD/NASA Agena D Agreement, 28 May 62.

181. Msg (C/Gp4) Cite SSH-1-6-4, 1 Jun 62.

182. Msg Cite SSH-2-6-7, 2 Jun 62 (S/Gp4).

183. SSD (SSH) Ltr to AFPRO (Col Voyles), Lockheed, subj: AFPR Surveillance of -68 Contract Spares Procurement, 4 Jun 62.

184. Msg from DCMSF to SSD, info MSFC, Cite MSFA 12-6-23, 121408Z Jun 62.

185. Ltr (Uncl w/o S/Gp3 Atch), subj: Request for Information by the Space Technical Objectives Task Group, 13 Jun 62, w/1 Atch: 648B Summary

186. Msg (C/Gp4) from Douglas Aircraft Co Inc, 151442Z Jun 62.

187. MFR, subj: Component Improvement Briefing to MajGen Ritland and Dr. Charyk, 25 Jun 62.

188. MFR (C/Gp4) from MSFA, subj: Agena D. Presentation, 25 Jun 62, 27 Jun 62.

189. MFR, subj: Agena D Funding, 28 Jun 62.

190. Msg, Cite MSFA 28-6-61, 281813Z Jun 62

191. SSD (SSRDA) Ltr (C/Gp4) to multiple address, subj: Agena D Optional Equipment Weight Status, 3 Jul 62.

192. SSD (SSVZO) Ltr to SSHAG, subj: Conversion of AMR Complex 14 to an Atlas/Agena Configuration, 5 Jul 62.

193. SSD (SSH) Ltr to multiple address, subj: Agena D Configuration Control, 9 Jul 62.

194. SSD (SSH ltr to multiple address, subj: Configuration Control of Agena D, 11 Jul 62.

195. CCN Status Contract AF 04(695)-21 As Of 12 July 1962.

196. SSD (SSZDB Ltr to BSRGT and SSVX, subj: Program Designation Change, 12 Jul 62.

197. SSD (SSH) Ltr (C/Gp4) to SSG-1 (Col Wickland), subj: International Programs, 12 Jul 62.

198. SSD (SSH)Ltr to AFSC (SCGN Col Nudenberg), subj: 648B Monthly Program Progress and Status Report Period Ending 30 June 1962, 13 Jul 62.

199. SSD (SSH) Ltr to SSKR (Mr. Montgomery), subj: Preliminary Impact Evaluation of Impending Aerospace Industry Strike on SSD Programs (Reports Control Symbol (RCS) AF-XDL-N2, w/1 Atch: Report.

200. SSD (SSHAA-2 ltr to 6593 Test Group, subj: LR81 Rocket Engine, 20 Jul 62.

201. SSD (SSHAA) Ltr to Lockheed, subj: Agena Multiple Start Engine Compatibility with DOD Missions, 25 Jul 62.

202. SSD (SSHR) Ltr to ASD, subj: Request for Type Designation, Agena D Vehicle, 26 Jul 62.

203. Msg from Douglas Aircraft Co Inc to Lockheed, 1 Aug 62.

204. SSD (SSHKK) to SSH, subj: AF 04(695)-194, Authority for Non-Competitive Negotiated Procurement, 1 Aug 62.

205. Msg from SSD to ARDC, cite SSH 2-8-1, 2 Aug 62.

206. SSD (SSHAA) Ltr to Lockheed, subj: Agena Rocket Engine Designations, 3 Aug 62.

206a. SSD (SSHGD) Ltr to AFPRO, Lockheed, subj: Requirement for Vehicle Transporter, 3 Aug 62.

207. SSD (SSH) Ltr to multiple address, subj: Technical Manuals for Agena B, 10 Aug 62.

208. SSD (SSHKK) Ltr to SSHR (Maj Harnes), subj: Transfer of Agena D Program Management, 13 Aug 62.

209. Msg from SAFOI-3C Maj Moore for release 15 Aug 62.

210. SSD (SSHGD) Ltr to multiple address, subj: Auto-DRAPE Orientation, 16 Aug 62.

211. SSD (SSHAA) Ltr to Lockheed, subj: Establishment of Agena-D Prelaunch Conditions, 20 Aug 62.

212. SSD (SSHAA) Ltr to Lockheed, subj: Agena Multiple Start Engine Compatibility with DOD and NASA Program, 24 Aug 62.

213. Status Report on Agena D (Program S-01A) August 62.

214. Msg from SSD to Lockheed, Cite SSH 27-8-33, 27 Aug 62.

215. Memorandum of Agreement, subj: Management Relationships Between SSH-SSZI, SSZN, SSZX and LMSC, 5 Sep 62.

216. SSD (SSHKK) Ltr to multiple address, subj: Authorization for type of Contract; Contract AF 04(695)-198, 7 Sep 62, w/1 atch.

217. SSD (SSHR) Ltr to SSZ, subj: Agena D FY-63 Funding Requirements to Support SSZ Program Requirements, 11 Sep 62.

218. SSD (SSH) Ltr to SSVR, subj: Agena D FY-63 Funding Requirements to Support NASA Program Requirements, 11 Sep 62.

219. Msg from SSD to CSAF, Cite SSH-13-9-10, 13 Sep 62.

220. Msg from SSD to AFSC, Cite SSH-13-9-11, 13 Sep 62.

221. SSD (SSHAA) MFR to Capt George W. Watts, 17 Sep 62.

222. SSD (SSH) Ltr to Lockheed, subj: Production of Optional Kits under the -68 Contract, 24 Sep 62.

223. SSD (SSG) Ltr to Secy of the Air Force (SAFFM), subj: FY-62 and FY-63 Agena D Funding Requirements, 27 Sep 62 (S/Gp3).

224. SSD (SSH) Ltr to Lockheed, subj: First Article Configuration Inspection of S-01A/13, 17-19 Sep 62, 28 Sep 62.

225. Msg Cite SSH 28-9-33, 28 Sep 62.

226. Lockheed ltr to AFSSD (DCCA), subj: Management of the S-01A Program, 1 Oct 62, w/1 Atch: Program Management Paper.

227. 1st Ind (Uncl w/o C/Gp4 Atch), SSD to SSVSP, subj:Liquid Rocket Engine Data, 5 Oct 62, w/1 Atch: Engine Data Chart.

228. SSD (SSHGD) Ltr to Lockheed, subj: Ground Rules for Management of the AC-1 System, 8 Oct 62.

229. Msg, Cite SSH 12-10-23, 12 Oct 62.

230. SSD (SSH) Ltr to SSG, subj: Agena Presentation, 15 Oct 62.

231. Msg (C/Gp4), Cite SSH 15-10-28, 15 Oct 62.

232. 1st Ind, SSD (SSH) to SSVZR, subj: Agena D/Gemini Configuration," 16 Oct 62.

233. Memorandum to SSH (Col Fletcher), subj: S-01A Requirements Based on TAT Boosted Missions, 18 Oct 62.

234. SSD (SSH) Ltr to AFPRO (Col Voyles), Lockheed, subj: AFPR Logistics Surveillance of Program S-01A, 19 Oct 62.

235. SSD (SSHR) Ltr to SSVZR (MajAlbert), subj: Optional Equipment Requirements for S-01A Vehicles, 22 Oct 62.

236. SSD (SSH) Ltr to SSHKK, subj: Sole Source Justification, Contract AF 04(695)-221, 22 Oct 62.

237. Msg, Cite SSH 23-10-37, 23 Oct 62.

238. SSD (SSHR) Ltr to SSO (Col Hedrick), subj: Agena D C&C Optional Equipment, 31 Oct 62.

239. SSD (SSHR) Ltr to SSVR, subj: Agena D FY-63 Funding Requirements to Support NASA, 1 Nov 62.

240. SSD (SSH) Ltr to Lockheed, subj: S-01A Vehicle Assignment Philosophy, 2 Nov 62.

241. SSD (SSH) Ltr to Lockheed, subj: Fixed Ullage Rocket Carrier Problem, 8 Nov 62.

242. SSD (SSHKK) Ltr to multiple address, subj: Request for Authority to Extend Definitization Data and to Obligate Additional Funds - Letter Contract AF 04(695)-68, Agena D, 14 Nov 62.

243. SSD (SSH) Ltr to SSVZ, subj: Proposed NASA/Air Force Management Agreement, 14 Nov 62.

244. SSD (SSHKK) Ltr to multiple address, subj: Request Authorization for Letter Contract AF 04(695)-233, 16 Nov 62.

245. SSD (SSHGD) Ltr to 6595 ATW (Col Perry), subj: Umbilical Test Philosophy and Blanket Removal for SLV3/S-01A/Payload FSV, 26 Nov 62.

246. Msg (C/Gp4), Cite AFSSV-KQ 98986, 302127Z Nov 62.

247. SSD (SSH) Ltr to Lockheed, subj: First Article Configuration Inspection of S-01A/19, 6-23 Nov 1962, 12 Dec 62.

248. Historical Data - Jul-Dec 1962 from SSZAR to SSZA, 24 Jan 63.

249. NASA Ltr to Gen B. A. Schriever, 25 Jan 63.

250. Contractor Performance Evaluation Report on AF Contract AF 04(695)-21, with Lockheed Missile and Space Company, Sunnyvale, California, 14 Feb 63, (C/Gp4).

251. Ltr sgd Gen B. A. Schriever to Dr. Robert C. Seamans, Jr., 6 Mar 63.

252. Space Systems Division USAF S-01A Management Package, 20 Mar 63 (S/Gp3).

253. Msg, Cite MSFA 16-4-35, 161700Z Apr 63.

254. SSD (SSV) Ltr to Distribution, subj: Letter of Understanding Between NASA Lewis Research Center and USAF Space Systems Division for Transfer of NASA Agena Contracts, 9 May 63.

255. SSD (SSZAC) Ltr to SSZN and SP-206, subj: Configuration Control Management of Program S-01A Booster Vehicles, 19 Jun 63 (S/Gp4).

256. Msg Cite AFRSTD 76993, undated, and Msg Cite MSFA 15-7-22, 1520457 Jul 63.

257. AFSC (MSFAR) Ltr to multiple address, subj: Transmittal of Memorandum of Agreement, 20 Aug 63, w/1 Atch: USAF-NASA Memorandum of Agreement NASA Office of Space Sciences Agena Launch Vehicle Program, 9 Aug 63.

258. SSD (SSVA) Ltr (C/Gp4) to SSV, subj: Annual Report of Achievements (3 Oct 1962 - 3 Oct 1963), 27 Sep 63.

259. DOD News Release No. 1396-63, 21 Oct 63.

260. Msg Cite MSFA 7-11-6, 071956Z Nov 63.

261. Summary Report - Transfer of NASA Agena Programs from AFSSD to NASA LeRC, 31 Dec 63.

262. SSD (SSVAT Ltr to Hq AFSC (MSFA), subj: Summary of Transferred Agena Programs, 3 Jan 64.

263. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atch), subj: Historical Report: 1 Jul 1963-31 December 1963, 4 Feb 64, w/2 Atch.

264. SSD (SSVAC Ltr to SSVA (Col Blum), subj: Erection of Thor-Agena in Front of Building A, 16 Apr 64.

265. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 January 1964-30 June 1964, 12 Aug 64, w/5 Atch: 1 (U); 2 (C); 3 (U); 4 (C); 5 omitted; 6 (C).

266. SSD (SSG) Ltr (Uncl w/o C/Gp4 Atch) to ARDC (DMSF MajGen Ritland), subj: Recent Agena Flight Problems, 12 Nov 64, w/1 atch: Proposed letter to Sec McMillan from Gen Schriever, w/1 atch.

267. SSD (SSG) Ltr (Uncl w/o C/Gp4 Atch) to AFSC (Gen Schriever, subj: General Dynamics/Astronautics Proposal to Increase SLV-3/Agena Payload Capability, 27 Nov 64, w/2 Atch; Atch 1 C/Gp4.

268. SSGA Memorandum for Generals Funk and Cooper (FOUO), subj: Request for Authority to Raise Major Agena Subcontractors to Associate Status, 10 Dec 64.

269. SSD (SSK) Ltr (C/Gp4) to AFSC and Hq USAF (in turn), subj: Request for Determination and Findings Pursuant to AFPI 3-214, 25 Jan 65.

270. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 July 1964 - 31 December 1964, 5 Feb 65, w/5 Uncl Atch.

271. Gemini Atlas Agena Target Vehicle System, Management and Responsibilities Agreement between the National Aeronautics and Space Administration Manned Spacecraft Center and The United States Air Force Air Force Systems Command, Space Systems Division, Mar 65.

272. SSD (SSGA) MFR, subj: Biosatellite Program -- Call from Cols Pickering and Swan of AMD, 9 Mar 65.

273. Memorandum for Gen Funk, Thru Gen Cooper, from Col Hamilton, subj: Advanced Life Support Capsule, 2 Apr 65.

274. SSD (SSK) Ltr (C/Gp4) to AFSC and Hq USAF (in turn), subj: Request for Determination and Findings Pursuant to AFPI 3-214, 25 May 65.

275. SSD (SSLO) Ltr to AFSC (SCOO), subj: Request for Organization Change - Gemini Agena Division (SSVAT), 29 Jul 65.

276. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, 1 January 1965 - 30 June 1965, 9 Aug 65, w/5 Atch: Atch 1 (C/Gp4).

277. Msg Cite SSG 10111, 20 Oct 65.

278. SSD (SSV) Ltr to SSGS (B/Gen Martin), subj: Program 206-II Agena Launch Capability Contract, 3 Nov 65.

279. AFSC Ltr sgd Gen B. A. Schriever to SSD (MajGen Funk) and AEDC (BrigGen Gossick), 22 Nov 65.

280. Msg Cite SSG 10125 Nov 65.

281. SSD (SSVA) Ltr (C/Gp4) to SSEH, subj: Historical Report, w/6 Atch: 1. (U); 2. omitted; 3 (U); 4. (U); 5 (C); 6. (U); 7. (C), 8 Feb 66.

282. SSD (SSK) Ltr to AFSC and Hq USAF, subj: Request for Determinations and Findings Pursuent to AFPI 3-214, 8 Jul 66.

283. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atchs 2, 4, 5 & 8), subj: Historical Report for the Period of 1 January 1966 - 30 June 1966, 29 Jul 66.

284. SSD (SSV) Ltr to SSGS (Gen Martin), subj: Agena Guidance and Control Subsystem Development, 1 Feb 67, (C/Gp3).

285. SSD (SSVA) Ltr (Uncl w/o C/Gp4 Atch 2, 7, 8 & 9) to SSV, subj: Historical Report, 1 Jul 66 to 31 Dec 66, 3 Feb 67.

286. DAF Ltr (C/Gp3) to SSVA, subj: Attitude Control System Configuration, 8 Feb 67.

287. DAF (SP-7B) Ltr to SSVA (Major Bell), subj: Standard Agena Allocation, 13 Feb 67.

288. AFRPL (RPG) Ltr to SSD (SSGV/Col D. V. Miller), subj: Advanced Agena Development, 26 Mar 67.

289. SSD (SSVAP) Ltr (S/Gp3) to SSEH (Mr. McClellan), subj: Users of Standard Agena Vehicle, 7 Apr 67.

290. SSD (SSVA) Ltr to SSV (Col Hamilton), subj: Improved Agena Development Program, 28 Apr 67.

290a. Briefing Charts (S/Gp3), Report of Special Board on Agena Procurement, SAFSP, 1 May 67.

290b. Msg (C/Gp3), Cite SSG 67-12, 24 May 67.

290c. Msg (C/Gp4), Cite SCSS 22931, 262111Z 67, May 67.

291. SSD (SSV) Ltr to SAFSP (Gen Martin), subj: SSD Position on SAFSP Proposal for a New Production Management Concept for Agena, 2 Jun 67.

292. MFR sgd Maj Robert R. Crawford, 7 Jun 67.

293. SSD (SSVA) Ltr (C/Gp3) to SSGS (Gen Martin), subj: Improved Agena Performance Requirements, 12 Jun 67.

294. DAF (SP-2) Ltr (C/Gp3) to multiple address, subj: Improved Agena, 15 Jun 67.

295. Lockheed Briefing Charts, subj: Customized Standard Agena, 21 Jun 67.

296. DAF (SP-1) Ltr (C/Gp3) to SSG (Gen Cooper), subj: Improved Agena, 23 Jun 67.

297. MFR sgd MajRobert F. Crawford, subj: Improved Agena Requirements Meeting, 28 Jun 67.

298. Briefing Charts on Agena D and E Management Problems, 11 Jul 67.

299. SAMSO (SMVA) Ltr (Uncl w/o C/Gp4 Atch 5 and 8) to SMV, subj: Historical Report, 27 Jul 67.

300. Program Plan, subj: Customized Standard Agena, Support Engineering Program Plam, Contract [redacted] 27 Jul 67.

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301. Briefing Charts, subj: Standard Agena, 28 Jul 67.

302. SAMSO (SMVA) Ltr to SMGS (Gen Martin), subj: Agena D Contract Structure, 2 Aug 67.

303. SAMSO (S G) Ltr (C/Gp4) to SAFSP (Gen Martin), subj: Improved Agena Flight Test, 11 Aug 67.

304. DAF (SP-1) Ltr (C/Gp3) to SMG-2 (Gen Cooper), subj: Improved Agena Flight Test, 14 Aug 67.

305. SAMSO (SMV) Ltr to SAFSP (Gen Martin), subj: New Production Management Concept for Agena, 22 Aug 67.

306. DAF (SP-1) Ltr (C/Gp3) to SMG-2 (Gen Cooper), subj: Improved Agena, 30 Aug 67.

306a. SAMSO (SMG-2) Ltr (C/Gp3) to SMGS (Gen Martin, subj: Improved Agena, 7 Sep 67.

306b. DAF (SP-1) Ltr (S/Gp3) to SMG-2 (Gen Cooper), subj: New Production Management Concept for Agena, 8 Sep 67.

306c. Memorandum for Gen O'Neill (C/Gp4) sgd MajGen Paul T. Cooper, subj: New Production Management Concept for Agena, 18 Sep 67.

307. MFR sgd LtCol Allen J. Poor, subj: Custom Agena-Briefing to Gen Martin, 19 Sep 67, w/1 Atch: Briefing Charts, subj: Custom Agena.

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308. DAF (Sp-2) Ltr (S/Gp3) to SMG-2 (Gen Cooper), subj: Procurement of Agena for SAFSP, 20 Sep 67.

309. SAMSO (SMG) Ltr to SCOM-27 (Col F. G. Morris, Jr), subj: Manpower Packages for the Titan III S and the Agena Program Office, 10 Oct 67.

310. Msg (S/Gp4), Cite SCSSM 36065, 182134Z Oct 67.

311. DAF [redacted] Ltr (Uncl w/o S/Gp3 Atch) to [redacted] (LtCol Wheeler, subj: Agena D Flight Summary, 25 Jan 68, w/1 Atch same subj.

312. DAF [redacted] Ltr to SME, subj: Final Agena Historical Report, 1 July - 19 October 1967, 15 Apr 68.

313. List of Contracts (containing Estimated Face Value) (C/Gp4), subj: Agena Vehicle, undated.

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MAR 16 01 10 '57

PRIORITY

X AF

COMDR, WDD, INGLEWOOD, CALIFORNIA

COFS
HQ USAF
WASHINGTON, D. C.

"AC—PARAPHRASING NOT REQUIRED EXCEPT PRIOR TO CATEGORY B ENCRYPTION—PHYSICALLY REMOVE ALL INTERNAL REFERENCES BY DATE-TIME GROUP PRIOR TO DECLASSIFICATION—NO UNCLASSIFIED REFERENCE IF DATE-TIME GROUP IS QUOTED."

~~SECRET~~ FROM WDTR 3-2-E FOR COL RALPH NUNZIATO, AFDRD-C REFERENCE YOUR TELECON GENERAL RITLAND 15 MARCH 1957 PD THE FOLLOWING ARE IMMEDIATE REQUIREMENTS FOR P-100 FUNDS FOR WS 117L BUYING PROGRAM FY 57 PD ONE MILLION FIVE HUNDRED THOUSAND FOR TEN EACH BELL HUSTLER ENGINES CLN TWO HUNDRED SIXTY THOUSAND FOR A/C (315A) GUIDANCE PLATFORM CMM TYPE TWENTY IG GYROS CMM ACCELEROMETERS CMM MECHANICAL CONTROL EQUIPMENTS AND ASSOCIATED GYRO AND ACCELEROMETER ELECTRONIC COMPONENTS CLN ONE HUNDRED SIXTY THOUSAND FOR GIMBAL COMPONENTS FOR BELL ENGINES CLN ONE HUNDRED THOUSAND FOR PROPELLANTS FOR GROUND PROPULSION TESTS CLN SIX HUNDRED THOUSAND DOLLARS FOR THREE WS 117L SATELLITE AIRFRAMES CLN THREE HUNDRED THOUSAND DOLLARS FOR ASSORTED AIRBORNE COMMUNICATIONS EQUIPMENT CLN EIGHT HUNDRED THOUSAND DOLLARS FOR PROCUREMENT OF AEROBEE HI ROCKETS, BEACONS, TELEMETRY EQUIPMENT CMM BIAXIAL POINTING CONTROLS CMM AIRBORNE TIMING EQUIPMENT

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15 Mar 57

WDTR

Major Raymond E. Zelenka
1343

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~~SECRET~~

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

~~CONFIDENTIAL~~

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

WDTR 57-39

[redacted]~~RET~~

~~CONFIDENTIAL~~

AND POWER SUPPLIES FOR GEOPHYSICAL ENVIRONMENTAL TEST FLIGHT PROGRAM CLN ONE HUNDRED EIGHTY THOUSAND DOLLARS FOR SEVEN UNITS OF BATTERY AUXILIARY POWER UNITS PD TOTAL OF ABOVE P-100 FUNDS THREE MILLION NINE HUNDRED THOUSAND DOLLARS PD ALL ABOVE CITED FUNDS ARE FOR EITHER BASIC SATELLITES OR SATELLITE BORNE EQUIPMENT OR FOR ROCKETS AND ROCKET BORNE GEAR FOR GATHERING ESSENTIAL DESIGN DATA PD

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~~CONFIDENTIAL~~

WDTR 57-69

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NDG 5 Apr 57

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WDTR

APR 8 1957

Major General D. J. Keirn
Chief, Aircraft Reactors Branch
Division of Reactor Development
Atomic Energy Commission
Atomic Building
Washington, 25 D.C.

EXCLUDED FROM AUTOMATIC
REGRADING: DOD DIR 5200.10
DOES NOT APPLY

Dear Don:

The characteristics of nuclear reactor and radioisotope power units specified in your letter of 19 March 1957, are consistent with WS 117L requirements, and the development objectives outlined therein are confirmed. The indicated AEC/USAF division of responsibilities is acknowledged, and is accepted with two suggested changes:

(1) That alternator output parameters be selected for optimum design of the entire weapon system rather than for optimization of the APU alone, and that such selection be made jointly under cognizance of the coordinating committee which you have proposed.

(2) That portions of the radiation shield necessary to protect the reconnaissance system but which are most effectively introduced as integral parts of the APU, be included in AEC design responsibility. The amounts of shielding so placed cannot be precisely specified until radiation tolerances have been established by the shielding and damage study which you have recommended and which will be undertaken by the system contractor.

Items (1) through (8) of your request for engineering data have been referred to the system prime contractor. The information requested will be furnished at a later date. Item 9 concerning system test and operational dates is best answered in the 2 April 1957 issue of the Development Plan for WS 117L. Additional information related to your activities is contained in the Development Plan for the Auxiliary Power Subsystem, WS 117L, Project 1757, also dated 2 April 1957. Distribution of these documents will be made to your office.

As you will note in the referenced development plans, the first radioisotope APU to be delivered to the Air Force, in September 1959, will be utilized for ground tests. The second unit is scheduled for flight test in the [illegible] quarter of calendar year 1960. Based on current plans, [illegible] during 1960 will not exceed the limit of five (5) units which you have specified.

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~~RESTRICTED DATA~~

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Your selection of cerium 144 in preference to polonium 210 for the radioisotope power source is supported. Hard gamma radiation associated with the cerium source can be adequately shielded within weight allocations. Although a 60 day lifetime at 500 watts has been specified and is agreed upon, the slow decay of cerium 144 permits considerably longer life at slightly reduced power.

Each radioisotope APU will be fueled with approximately one million curries of cerium 144. Containment or safe dispersal of this material upon reentry, abortive launch, or under any conceivable circumstance is of course a basic engineering objective. Presuming that a high degree of safety is assured by successful design, there will remain the problem of dealing with individual and public apprehension. The geographically uncontrolled reentry of such an enormous quantity of long-lived contaminant cannot be expected to be accepted without considerable opposition. It is believed that this issue should be explored at the earliest possible date, in order that plans for future use of a radioisotope power unit in the WS 117L vehicle may be based upon more adequate assurances of approval. Your recommendations for pursuing the matter are invited.

In accordance with your suggestions concerning coordination and interchange of information between AEC contractors and the WS 117L prime contractor, distribution of appropriate Lockheed Aircraft Corporation technical reports will be made to the Glenn L. Martin Company and North American Aviation, Inc. Establishment of a coordinating committee with AEC members as indicated in your letter is accepted. Major George E. Austin, Western Development Division, is appointed chairman of this committee. Lockheed members will be designated at a later date. It is proposed that the first committee meeting be held on 4 and 5 June 1957 at the Western Development Division. If these dates are agreeable, items which you wish included on the agenda and specific questions for which you desire answers should be forwarded to Major Austin prior to 15 May 1957.

Sincerely,

ORIGINAL SIGNED:
B. A. SCHRIEVER

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AIR FORCE BALLISTIC MISSILE DIVISION

SEP 23 1957

WDTR

SUBJECT: AFBMD Policy Review of LAC/MSD Report 35804 "General Test Plan and Related Facilities and Equipment"

TO: Lockheed Aircraft Corporation
Missile Systems Division
ATTN: Mr. L. E. Root
P. O. Box 504
Sunnyvale, California

1. This letter represents the Air Force Ballistic Missile Division policy and general comments resulting from a review of the LMSD Report 35804. Policy statements will be made on two aspects of this document. First on the test plan and test philosophy and second on the equipment which LMSD has indicated they anticipate will be procured from the supplies contract funds.

2. Test Plan and Test Philosophy

The comments that follow are derived from something more basic than a test plan and philosophy; they involve the system development philosophy. LAC/MSD has been designated as the Prime Weapon System Contractor for WS 117L. This does not mean that LAC/MSD is expected to perform R&D, design, manufacture and test of the many components of the system. It is considered that such an approach would be both time-consuming and expensive. The present approach of LMSD is deemed to lean too far in this direction. The extent of this "in-house" development trend is further confirmed by the disproportionate share of costs as reflected in the contractor's latest proposal. Therefore the following philosophy should be immediately implemented by LAC/MSD in the development and test of the WS 117L system.

a. Component parts to include entire subsystems of WS 117L, should be procured through the medium of subcontractors or vendors who have the capability, including personnel, facilities and experience to develop and manufacture the class of equipment to be procured. For example, there are many commercial concerns who are experienced in the areas of autopilots, hydraulic actuators, the associated transistorized electronic gear, infrared detectors,

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solar cells, guidance systems, radars, etc. Work retained for "in-house" development or manufacture by LMSD should be only that where a critical comparison with other sources indicates an existing superior capability.

b. Parts, components, subassemblies and subsystems should be procured by LAC/MSD in accordance with LMSD prepared specifications which include a test plan for the testing of the part, component, subassembly or subsystem procured. Principal reliance will be placed on subcontractor facilities for test activities of the subcontractor developed equipment.

c. LMSD role as Prime Weapon System Contractor is to provide for that detailed weapon system development and for production and installation of certain portions of weapon systems, including necessary planning and scheduling, under the supervision and final authority of the Air Force. It is stated Air Force policy that; "owing to the increased technical complexity of present day weapon systems, subsystems and equipment, the increased necessity for obtaining compatibility and integration of the various subsystems and equipments in a weapon system, the normal practice of the Air Force will be to accomplish weapons system development through weapon system contractors". It is also Air Force policy that sufficient control will be exercised over weapon system contractors to insure that:

(1) "A vigorous and healthy equipment industry is maintained".

(2) "A proper industrial base in the equipment industry is maintained to provide for rapid production expansion in the event of mobilization".

(3) "Only reasonable profits and costs are allowed".

(4) "Government-recognized standards are used to the maximum practicable extent".

(5) "Duplication of development is avoided".

d. The complex nature of WS 117L and the unusual demands for reliability imposed by its operational concept and environment do establish a requirement for a carefully planned and executed test program. Further, the scope of WS 117L has involved the system in practically every field of technology each of which will be used to the ultimate state-of-the-art. The Air Force does not anticipate the development of the Lockheed Aircraft Corporation as experts in each of these fields of technological endeavor. The development philosophy expressed in the preceding paragraphs is herein extended [illegible] to the testing of part, component, subassembly, subsystem of WS 117L, wherein the part component etc., procured on a subcontract will be tested by that subcontractor to meet the specifications as to reliability, environment and operation as specified. LMSD will be responsible for the integration and assembly of these tested parts, components, subassemblies and subsystems into an integrated WS 117L, and will be responsible for the system testing of WS 117L together with the subcontractor and/or vendor. Lockheed Aircraft Corporation should not plan for tests at Lockheed Aircraft Corporation facilities ~~that will require disassembly of subcontractor supplied parts,~~ components, etc.

3. Special Test Equipment:

LMSD management representatives stated during the course of negotiations which led to letter Contract AF 04(647)-97, that no government procured facilities would be required at the contractor's plant. This position by LMSD had a considerable influence in determining who received the contract award. Contract AF 04(647)-97 specifically states (Part IV, Item A) "it is contemplated that the contractor shall furnish industrial facilities and plant equipment required in the performance of this contract". Part IV of the contract further defines the terms used in this part as being those contained in the ASPR's. Most of the equipment listed in LMSD Report 3580L as "special test equipment" is not considered to fall within the ASPR definition. Most of the equipment listed is composed of standard or facility type items used together for a specific purpose as is normal in any laboratory or development program. It has been determined through considerable consultation within the Air Force that ASPR definition must be applied to the components and not the assembly. Therefore, the following are stated as Air Force and Weapon Systems Office policy:

a. When an entire assembly, including its major components is developed especially to produce or test a WS 117L part, component, subassembly or subsystem, or the complete 117L system, then it is a proper charge to the supply contract. When a component of an over-all test assembly would "require substantial modification" to be suitable for other use, it is also special and chargeable to the supply contract. In this category are dies, jigs, fixtures, special distribution panels, specially fabricated consoles, the S.T.F. superstructure (i.e. that part actually tailored to a particular vehicle).

b. Test consoles and inspection equipment such as those defined in LMSD 3580L, Inclosures B and C, will be assembled wherever possible in such a manner that major component parts do not lose their identity or usefulness as general purpose equipment. (Example Oscillograph [illegible] Model [illegible] is still an Oscillograph). These items that fall in the definition of standard items, facilities and inspection equipment will not be approved for purchase with supply contract funds.

c. The fact that a given item of equipment will be expended during the course of the program does not make it "special test equipment", nor does the fact that LMSD may not have a sufficient quantity of a given item to meet all its requirements. Items in these categories will not be allowed as direct charges to the supplies contract.

4. The Air Force has approved the design study of items K, L, M, N, and O, inclosure G of LMSD 35804 through the Administrative Contracting Officer. This does not imply approval of the manufacture of these items as "special test equipment" "en toto". These items are not sufficiently well defined in LMSD 35804 to make this determination. Some items such as the flame deflection plate and water distribution system, water deluge and CO_2 distribution systems, visual monitor system and others may not warrant the "special" classification "en toto". Similar parts of items M, N, and O referenced above may not warrant the "Special" classification.

5. The policies expressed in this letter should be incorporated in the LMSD planning for WS 117L testing immediately. Provisions relating to facilities and special tooling, which are now in the letter contract, will be contained in the definitive contract and will be subject to the above interpretation.

SIGNED

cc: Mr. J. H. McLachlin

CHARLES H. TERHUNE, JR
Colonel, USAF
Deputy Commander
Weapon Systems

WDTR
Col. Riepe 1175

DISPOSITION FORM

SECURITY C IFIC N (If any)

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~~CONFIDENTIAL~~

FILE NO.	SUBJECT WEEKLY DIARY - 4 thru 10 October 1957		
TO MCPT	FROM MCPTA	DATE 10 Oct 57	COMMENT NO. 1

WS 117L Program - Lockheed Aircraft Corporation - L/C AF 04(647)-97

1. Status of Letter Contract Definitization: (UNCL)

The definitive proposal submitted by the contractor is being evaluated. The contractor has been requested to submit certain detailed back-up data, particularly with respect to labor hours, for the various subsystems. Constructive action cannot be taken, however, until a definite fund program is established. Obviously, if the amounts planned for this contract are not made available, the scope of the work must be reduced.

2. GFE: (UNCL)

A partial termination took place recently under the B-58 program, concerning a Bell Aircraft subcontract. Much of the termination inventory was determined to be useable on the WS 117L program. Requests were made for this materiel, and such requests were approved. Actual shipments of these items is taking place, commencing this week.

3. Status of Funds: (~~CONF~~)

Notification has been received from the contractor that he will reach the 85% point in the commitment of funds presently on contract, approximately 1 November. The 100% point of commitment will take place approximately 15 November. He has indicated that additional funds are necessary at this time to permit continuation of the program. No funds are presently available to be added to this contract. Therefore, a TWX was forwarded to Hq USAF outlining the problem and requesting immediate relief.

JAMES S. SEAY
Lt Colonel, USAF
Chief, WS 117L Branch
Deputy Director/Ballistic Missiles
Directorate/Procurement & Production

DOWNGRADED AT 12 YEAR
INTERVALS: NOT AUTOMATICALLY

~~CONFIDENTIAL~~

FORM 96 REPLACES AMC FORM 96, 1 OCT 48, WHICH MAY BE USED 16—54801-5 U. S. GOVERNMENT PRINTING OFFICE: 1955 [illegible]

-97
L/C
[illegible]
5

MCPTA 11 October 1957

MEMORANDUM FOR THE FILE

SUBJECT: Letter Contract AF 04(647)-97 - Lockheed Aircraft Corporation - Amendment #6

1. The purpose of this memorandum is to provide a background for the subject contractual action, and indicate the manner in which this action will be covered in the definitive contract.

2. Recently, a partial termination took place under the B-58 contract, AF 33(038)-21250. This contract is between Convair and the Air Force. It included a subcontract between Convair and Bell Aircraft Corporation to design and fabricate certain engines, designated XLR-81. As a result of the termination of this subcontract, certain items of fabricated engines, special tooling, ground support equipment, special test equipment, and spare parts are made surplus to the needs of the Government.

3. It has been found that most of the above mentioned termination inventory is useable under WS 117L. However, the detailed termination inventories have not been completed as of this date. In order to permit immediate use of certain items of this inventory, to conform to the requirements of the WS 117L program, it is necessary to commence shipment to Lockheed of such items. The subject amendment will authorize this action.

10

4. The negotiation of the definitive contract will include a list of GFE. This list will contain that portion of the termination inventory which is being furnished the subject contractor, and the contract price will be adjusted to reflect this GFE.

ESilberman

EUGENE S. SILBERMAN
Contracting Officer

4

~~CONFIDENTIAL~~

6

[redacted]

WDTR

FEB 14 1958

MEMORANDUM FOR COLONEL TERHUNE

SUBJECT: WS 117L Guidance and Control

1. A memorandum to you from Lt. Col. Box dated 6 February 1958 commented upon some aspects of the WS 117L Guidance and Control Program.

2. We have realized that a number of difficulties would develop at Lockheed connected with their approach to the problem. The cooperation and effort of representatives of WDTLG in studying the program have been very helpful. We have discussed these matters with them and have reached concurrence on all significant points.

3. Our actions on the major points of the memorandum are as follows:

a. The ACSP System will be used on the WS 117L/Thor.

b. The General Electric System will be used on the WS 117L/Atlas.

c. A Work Statement which will permit ACSP to start work has been coordinated through WDTLG and has been transmitted by teletype by the Contracting Officer.

d. A Work Statement for General Electric has been prepared and will be processed immediately in a similar manner.

e. The Burroughs Work Statement will depend upon initial studies by G. E. and will follow as soon as possible.

f. We concur that MIT needs definite direction. With further assistance from WDTLG it will be possible to formulate a satisfactory program.

g. In each case, funds are being transferred to cover costs.

h. WS 117L intends to become self-sufficient very soon on technical matters relating to guidance and control. A qualified officer is being assigned to this office and will be responsible for this work. Meanwhile, the assistance of Major Marlow and others is greatly appreciated.

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

Frederic C. E. Oder
FREDERIC C. E. ODER
Colonel, USAF
Assistant for WS 117L

49

~~CONFIDENTIAL~~

[redacted]

WDTR 58-85

(30)

R52

WDTS 29 March 1958

MEMORANDUM FOR COLONEL ODER, WDTSR

SUBJECT: Guidance and Control for WS 117L

1. I consider it most desirable for the WS 117L Project Office to obtain the assistance and support of the AFBMD technical divisions in their areas of particular competence. Specifically in the area of guidance and control where the WS 117L is involved with present GE, AC Spark Plug and MIT programs now monitored by the project officers within WDTSG, separate and independent action taken by the WS 117L Project Office or Lockheed Aircraft Corporation with these guidance contractors may well result in unnecessary confusion and undue interference.

2. Integration of the WS 117L Program into the AFBMD development plan covering other weapon systems and recent decisions raising WS 117L to equivalent National priority makes it most desirable to standardize, insofar as practicable, internal procedures for managing the 117L Program.

3. As an initial step in this direction, I desire that you work with the chiefs of the various technical divisions to arrive at a mutually agreed and understood procedure for handling the interface between WS 117L and the technical divisions. These procedures are to be reduced to writing and submitted to me for approval. The area of primary interest at this time is that of guidance and control as mentioned in paragraph 1 above.

12

SIGNED

HARRY L. EVANS
Colonel, USAF
Assistant Deputy Commander,
Space Systems

Copy furnished
Col Terhune
Col Ely
Col Dodge
L/Col Box
L/Col Ayres

~~CONFIDENTIAL~~

16

RECEIVED
WDD ARDC
ACTION WDTSR

TWX204-1 FROM LOCKHEED MSD PALO ALTO CALIF 4-2-58 900A
COMMANDER AIR FORCE BALLISTIC MISSILE DIVISION
ATTENTION COL F.C.E. ODER
INGLEWOOD CALIF

-3 APR 1958 18 58

~~/S E C R E T/ /S E C R E T/~~ LMSD/56167 WS117L/8938

SUBJECT L/C CONTRACT AF 04/647/-181
PROPOSED DEVELOPMENT FOR SHORT-TERM IMPROVEMENT OF NEW HORIZON PROPULSION SUBSYSTEM.

REFERENCE BMO LETTER /E. S. SILBERMAN/, SUBJECT AS ABOVE, DATED 3-17-58 /LMSD/56071/.

1. THE PRESENT STUDY IS LIMITED TO THE DISCUSSION OF POSSIBLE IMPROVEMENTS IN THE WS117L ORBITAL BOOST PROPULSION SYSTEM ONLY. THE EFFECT OF POSSIBLE BURNING PROGRAMS /COAST TO APOGEE, DOUBLE BURNING AND BURNING ALL THE WAY/ ON PROPULSION EFFICIENCY WILL BE DISCUSSED LATER. THIS DOES NOT INVALIDATE THE FINDINGS OF THIS STUDY SINCE THEY CAN BE APPLIED EQUALLY TO ALL BURNING PROGRAMS CONSIDERED.

2. THE FOLLOWING POSSIBILITIES WERE DISCARDED BECAUSE OF LONG LEAD TIME

A. HYDRAZINE FUEL, BECAUSE THIS WOULD REQUIRE THE DEVELOPMENT OF A NEW ENGINE, AND

B. THRUST VALUES CONSIDERABLY DIFFERENT FROM THOSE AVAILABLE WITH PRESENT ENGINES.

3. THE FOLLOWING POSSIBILITIES WERE INVESTIGATED AND COMPARED WITH THE PRESENT SYSTEM USE OF UDMH IN MODIFIED VEHICLE TANKS, GIVING AN INCREASE IN TOTAL PROPELLANT WEIGHT OF 12 PERCENT FOR THOR-BOOSTED VEHICLES.

A. IN CONJUNCTION WITH THE PRESENT PUMP-FED SYSTEM, USING A MODIFIED BELL LR81-BA3 ENGINE WITH 20 TO 1 NOZZLE EXPANSION RATIO. PAYLOAD INCREASE FOR THOR-BOOSTED FLIGHTS EQUAL 176.7 LBS. ENGINE CAN BE AVAILABLE FOR EARLY FLIGHTS OF PROGRAM IIA.

B. IN CONJUNCTION WITH GAS-FED SYSTEM /175 PSIA COMBUSTION CHAMBER PRESSURE, 7100 LBS. THRUST, 240 SECONDS DURATION/ USING

/1/ UNHEATED HELIUM AS PRESSURIZING AGENT, IN CONJUNCTION WITH A MODIFIED BELL LR81-BA3 ENGINE, 20 TO 1 NOZZLE EXPANSION RATIO PAYLOAD REDUCTION FOR THOR-BOOSTED FLIGHTS EQUAL 52 LBS. HELIUM CONTAINER /6000 PSIA/ VOLUME INCREASED BY FACTOR OF 4. SYSTEM NOT AVAILABLE FOR THOR-BOOSTED FLIGHTS PROGRAM IIA.

/2/ HEATED HELIUM /NOZZLE CONE HEAT EXCHANGER/ AS PRESSURIZING AGENT, IN CONJUNCTION WITH MODIFIED BELL LR81 ENGINE, 20 TO 1 NOZZLE EXPANSION RATIO.
PAYLOAD INCREASE FOR THOR-BOOSTED FLIGHTS EQUAL 60 LBS.
HELIUM CONTAINER /6000 PSIA/ VOLUME INCREASE BY FACTOR OF 2.5.
NOT AVAILABLE FOR THOR FLIGHTS PROGRAM IIA.

/3/ HEATED HELIUM /INTERNAL SOLID PROPELLANT CHARGE, VANGUARD SYSTEM/ AS PRESSURIZING AGENT, IN CONJUNCTION WITH
/A/ MODIFIED BELL LR81 ENGINE, 20 TO 1 NOZZLE EXPANSION RATIO.
PAYLOAD INCREASE FOR THOR-BOOSTED FLIGHTS EQUAL 87 LBS.
HELIUM CONTAINER /2700 PSIA/ VOLUME INCREASED BY FACTOR OF 9.
NOT AVAILABLE FOR THOR-BOOSTED FLIGHTS PROGRAM IIA.
/B/ AEROJET VANGUARD SECOND-STAGE ENGINE.
PAYLOAD INCREASE FOR THOR-BOOSTED FLIGHTS EQUAL 130 LBS.
HELIUM CONTAINER /2700 PSIA/ VOLUME INCREASED BY FACTOR OF 9.
NOT AVAILABLE FOR THOR-BOOSTED FLIGHTS PROGRAM IIA.

4. GAS-FED SYSTEMS GIVE EXCESSIVE WEIGHT AT THE PRESENT STATE OF THE ART, WHERE COMBUSTION CHAMBER PRESSURES BELOW 175 PSIA ARE NOT OFFERED BY ENGINE MANUFACTURERS WITH AVAILABLE ENGINE DESIGNS. THIS CONDITION MIGHT BE CHANGED CONSIDERABLY AFTER COMPLETION OF THE PRESENT R & D PROGRAM CONDUCTED BY BELL AIRCRAFT CORPORATION. IT APPEARS, HOWEVER, DOUBTFUL THAT A LOW-PRESSURE ENGINE GIVING ADEQUATE INCREASE WILL BECOME AVAILABLE IN TIME FOR INCORPORATION INTO THE SHORT-TERM IMPROVEMENT PROGRAM UNDER DISCUSSION IN THE PRESENT STUDY.

85 IS THEREREFORE RECOMMENDED THAT THE FOLLOWING ACTION BE TAKEN

A. MODIFICATION OF THE LR81-BA3 ENGINE FOR USE OF UDMH FUEL AND BY INCREASING THE NOZZLE EXPANSION RATIO TO 20 TO 1.

B. USE OF GAS-FED SYSTEM IN CONJUNCTION WITH THE DEVELOPMENT OF A NEW HIGH-ENERGY PROPULSION SYSTEM, AS VISUALIZED UNDER PARAGRAPH /H/ OF EXHIBIT B, CONTRACT AF 04/647/-181

~~CONFIDENTIAL~~

6. USING PRELIMINARY COST FIGURES OBTAINED FROM THE SUBCONTRACTOR AND APPLYING THE METHOD DEVELOPED BY CAPT. TRUAX, IT APPEARS THAT THE ENTIRE SUBCONTRACTOR DEVELOPMENT COST FOR THIS PROGRAM WILL BE AMORTIZED AT THE COMPLETION OF THE PRESENTLY CONSIDERED IIA PROGRAM. THIS DEVELOPMENT INCLUDES THE PREPARATION OF A MODEL SPECIFICATION, DEVELOPMENT OF THE ENGINE THROUGH PFRT, DELIVERY OF THREE GROUND TEST AND TWO FLIGHT-RATED ENGINES, DELIVERY OF MANUFACTURING EXTRAS INCLUDING TWO THRUST CHAMBERS, PREPARATION OF A HANDBOOK AND OF COMPONENT SPECIFICATIONS, PERFORMANCE OF ENGINE STARTING TEST WITH PROTOTYPE VEHICLE PROPELLANT LINES, AND PERFORMANCE OF AN EXTENDED PROGRAM FOR THE DETERMINATION OF ENGINE PERFORMANCE CHARACTERISTICS AND TOLERANCES.

7. AN ESTIMATE FOR CONTRACT COSTS FOR THE IMPLEMENTATION OF THE PROPOSED MODIFIED SHORT-TERM IMPROVEMENT PROGRAM INTO THE WS117L PROGRA WILL BE PREPARED UPON YOUR REQUEST.

14

8 REVIEW OF THE PROGRAM REVEALS THAT UDMH ENGINE AVAILABILITY IS THE CONTROLLING SCHEDULE FACTOR. BELL REQUIRES 4-1-58 GO-AHEAD, SO AS TO DELIVER FIRST UDMH ENGINE BY 10-1-58. A 10-1-58 DELIVERY WOULD RESULT IN INCORPORATION OF ENGINE IN FLIGHT 4. NEGOTIATIONS ARE PRESENTLY UNDER WAY WITH BELL WHICH WILL PROVIDE FOR INCORPORATION OF UDMH IN SECOND FLIGHT. SUCH INCORPORATION TO FLIGHT 2 IS TECHNICALLY FEASIBLE WITH LMSD DEVELOPMENT.

9. LMSD CONTINUES TO SOLICIT EARLIER DELIVERY AND REQUESTS AIR FORCE ASSISTANCE IN THIS MATTER. IF ABOVE RECOMMENDATIONS MEET WITH YOUR APPROVAL, WE SPECIFICALLY REQUEST APPROVAL FOR BELL TO COMMENCE WORK IMMEDIATELY ON THE MODIFICATION OF THE LR81-BA3 ENGINE, PRIOR TO THE FINALIZATION OF THE ENTIRE SHORT-TERM PERFORMANCE IMPROVEMENT PROGRAM.

F W O"GREEN TECHNICAL DIRECTOR
XA DEVELOPMENT DIVISION.
915A 4/3/58..

DOWNGRADED AT 12 YEAR

CONFIDENTIAL

IN SAT-5

~~CONFIDENTIAL~~

~~SECRET~~

ACTION: WDG

IC-59

9

INFO: WDP WDT
WDGP
WDGEH
WDGK
WDGE

3 Jul 58

PP RJWZBK
DE RJEZFF 17C
P 031945Z
FM COMDR ARDC ANDREWS AFB MD
TO RJWZBK/COMDR AFBMD INGLEWOOD CALIF
RJEDSQ/COMDR ARDC DET 1 WPAFB OHIO
BT

~~/S E C R E T/~~ FROM RDZGW 7-4-E, ATTN CLN AFBMD, WDG. DET 1, RDZS FOLLOWING IS SPACE ACTIVITY DAILY FOR 3 JULY 1958 CLN 1. IN ORDER THAT AVAILABILITY OF BASIC PROPULSION UNITS WILL NOT LIMIT SELECTION OF THE MOST DESIRABLE SPACE PROGRAM USAF HAS AUTHORIZED AND DIRECTED INCREASED PROCUREMENT AS FOLLOWS CLN A. FOUR THOR BOOSTERS WITH DELIVERY TO BEGIN IN DECEMBER 1958, AT THE RATE OF 1 PER MONTH. B. FOUR ATLAS-D BOOSTERS WITH DELIVERY TO BEGIN IN MAY 1959, AT THE RATE OF 1 PER MONTH. C. FOUR WS-117L LOCKHEED VEHICLES /XLR-81 HUSTLER/ WITH DELIVERY TO BEGIN IN JANUARY 1959, AT THE RATE OF 1 PER MONTH. 2. DIRECTORATE OF SPACE SYSTEMS /RDZO/ REPRESENTATIVES

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

PAGE TWO RJEZFF 17C
MET WITH PERSONNEL FROM APGC TO DISCUSS AN APGC PROPOSED "SPACE RANGE" OVER THE GULF OF MEXICO. THE ARDC STAFF WILL REVIEW THEIR PROPOSAL AND FORMULATE AN ARDC POSITION AS TO THE PRACTICALITY/ FEASIBILITY OF SUCH A PROPOSAL. THE OFFICE OF PRIMARY RESPONSIBILITY IN THIS HEADQUARTERS IS DIRECTORATE OF RESEARCH VEHICLES AND FACILITIES /[illegible]/.
BT
03/1933Z JUL RJEZFF

EXCEPT PRIOR
PHYSICALLY RE-
BY DATE-TIME
GROUP PAGE TO DECLASSIFICATION

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~~CONFIDENTIAL~~

OIR 10

Trans period

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59

18-59

Sept. 4, 1958 Date

see amendment #1, 29 Sep 58
execution of this order
redirected to ARDC
#2 dtd 17 Oct 58
#3 " 26 nov 58
#4 dtd 10 apr 59
#5 " 13 apr 59
#6 " 18 may 59
#7 "
#8 " Jul 59

TO: Commanding General
Ballistic Missiles Division, ARDC
Los Angeles, California

1. Pursuant to the provisions of DoD Directive 5105.15, dated February 7, 1958, you are requested to proceed at once on behalf of the Advanced Research Projects Agency with the project specified below. Additional details and directives will be issued by ARPA from time to time and will become a part of this Order when so specified.

2. You are directed to provide two complete Thor Able 1 configuration vehicles for space project launchings ~~in January and February 1959~~. The estimated cost for these two vehicles excluding payload is $4,840,000. See amendment #2 dtd 17 Oct 58

See amend

made available to NASA

~~3. You are also directed to initiate additional procurement of two second stages and two third stages for use as later directed by ARPA.~~ See Amend. #2

2 to go to ARPA

4. You will submit as soon as possible for review and approval by the Advanced Research Projects Agency a detail development and related financial plan covering the program. These data shall include a time-phased schedule of work and estimates for work to be performed (a) by BMD, (b) by contract, and (c) at other Government facilities. In preparing the development plan, the relative emphasis on the segments of this work should be discussed with ARPA.

5. This Order makes available $4,840,000 under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects, Department of Defense" for obligation by the Ballistic Missiles Division on behalf of the Advanced Research Projects Agency only for purposes necessary to accomplish the work specified herein. These funds are immediately available for direct obligation and for use in reimbursing the BMD for costs incurred under this Order. Upon approval of development and financial plans, as required herein or in accordance with amendments to this Order, these funds will be increased as appropriate.

[illegible] INTERVALS;
[illegible] YEARS.
DOD DIR 5200.10

~~CONFIDENTIAL~~

6. The Director, Advanced Research Projects Agency, will provide policy and technical guidance, either directly or through designated resident representatives. The BMD will be responsible for arranging for the detailed technical directions necessary to accomplish the specified objectives and to comply with ARPA policy and technical guidance. This general relationship may be specified in greater detail by amendment to this Order if such action is necessary.

7. The Director, Advanced Research Projects Agency, and the Office of the Secretary of Defense will be kept informed by such management, technical, and accounting reports as may be prescribed.

8. The utilization of equipment and materials procured in connection with this project for other projects is subject to the direction of ARPA. Notwithstanding, final disposition of such equipment and materials shall be made in accordance with standard procedures. Any technical and scientific information relating to work under this Order which may be published from time to time shall give appropriate credit to the ARPA project. No scientific and technical progress and status reports on ARPA's projects or final completion reports prepared specifically at ARPA's request shall be made available to other agencies or individuals without approval of ARPA.

9. BMD shall be responsible for preserving the security of this project in accordance with the security classification assigned and the security regulations and procedures of the Department of the Air Force.

10. Notwithstanding any other provisions of this Order, BMD shall not be bound to take action in connection with the performance of this work that would cause the amount for which the Government will be obligated hereunder to exceed the funds made available, and the obligations to BMD to proceed with the performance of this work shall be limited accordingly. BMD shall be responsible for assuring that all commitments, obligations and expenditures of the funds made available are made in accordance with the statutes and regulations governing such matters, provided that whenever such regulations require approval of higher authority such approvals will be obtained from or through the Director, ARPA, or his designated representative.

Roy W. Johnson
Director

cc: Secretary of the Air Force

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D.C.

ARPA Order No. 17-59
Amendment No. 1

Sept 29, 1958 Date

18

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

ARPA Order No. 17-59, dated September 4, 1958, is hereby amended to redirect the responsibility for its execution from the Commander, Air Force Ballistic Missiles Division, ARDC, to the Commander, Air Research and Development Command.

Roy Johnson

Roy W. Johnson
Director

cc: Secretary of the Air Force
Commander, AFBMD, ARDC

~~CONFIDENTIAL~~

12

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59

Amendment No. 2

October 17, 1958 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

Paragraph 2 of ARPA Order No. 17-59, dated September 4, 1958, is hereby changed by deleting the words "in January and February 1959." Paragraph 3 of this Order is deleted in its entirety.

The purpose of this amendment is to permit the vehicles scheduled in January and February to be made available to NASA. It is understood that they will place their own order for those vehicles.

ARPA Order No. 17-59 as herein amended provides for the delivery of two complete vehicles to ARPA and includes the funds therefor.

You are requested to submit as soon as possible a schedule of availability of the vehicles herein ordered.

Roy W Johnson

Roy W. Johnson
Director

cc: Secretary of the Air Force

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59

Amendment No. 3

November 26, 1958 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

20

ARPA Order No. 17-59, dated September 4, 1958, as amended, is hereby further amended as follows:

Superseded by amendment 4 10 apr 59

1. Provide for the delivery of an additional eight Thor-based vehicles and two Atlas-based vehicles. The attached inclosure depicts the desired vehicle capacity for these vehicles as well as the capacity for the two Thor-Able vehicles (Nos. 1 and 3) purchased under Amendment No. 2, dated October 17, 1958. The latter two vehicles are assigned to the navigation and cloud cover programs of ARPA.

04

2. Submit within 30 days a development and related financial plan for the above program for review and approval by ARPA. A separate development and financial plan shall be submitted for the two vehicles procured under Amendment No. 2. The development plans should include the earliest possible launching dates as well as your recommendations and estimated costs for systems integration assuming that payloads will be provided.

3. Study the necessity for constructing a new Thor launching stand in support of the above program in the general area of the present Vanguard site (Launch Stand 18A). The receipt of this study prior to the receipt of the financial and development plans would be desirable.

4. Pursuant to paragraph 7 of ARPA Order No. 17-59, dated September 4, 1958, reporting on this Order will be accomplished by

~~DECLASSIFIED AFTER 12 YEARS.~~

UPON REMOVAL OF ATTACHMENTS THIS DOCUMENT BECOMES UNCLASSIFIED

[redacted] C8-125680

[redacted]

ARPA Order No. 17-59
Amendment No. 3

submission of monthly progress report. This report, which is to be submitted in accordance with procedures outlined in Attachment No. 1, represents ARPA's total foreseeable requirement for recurring reports based on this Order.

5. The fund availability under ARPA Order No. 17-59 is hereby increased from $4,840,000 to $5,090,000 under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Office of the Secretary of Defense." This increase will provide partial funding for the work assigned above.

J E Clark
for Roy W. Johnson
Director

2 Incls.: (Address only)
Attachment No. 1
Veh. Requirements List

cc: Secretary of the Air Force

[redacted]

Attachment No. 1 to
Amendment No. 3

ARPA Order No. 17-59

PREPARATION OF MONTHLY PROGRESS REPORT

This report will be submitted in two parts, a Narrative Section and a Milestone Progress Section.

Narrative Section. A letter report will be prepared each month by the addressee of the above numbered ARPA Order, giving a narrative account of work performed under the Order. The initial report will cover the period through December 1958. Subsequent reports will cover work performed during each month thereafter. The report will be submitted in quadruplicate to the Director, Advanced Research Projects Agency, and is due within 10 days following the close of the month reported. The ARPA Order number and subject of the project should be stated in the heading of each report.

The report will be in letter form and generally not exceed three pages in length. It will present a narrative summary of work performed, including technical status, major accomplishments, problems encountered, future plans, and any action required by ARPA. The initial report should include an introductory preface outlining the background, objectives, and assignment of responsibility for the project. All reports should include photographs and illustrations as appropriate.

Milestone Progress Section. Instructions for preparation of this section, which requires use of a standard format in reporting actual progress against planned progress in accomplishing major milestones, will be issued at a later date.

[redacted]

VEHICLE REQUIREMENTS

Vehicle	Desired Launch Date	Payload Gr. Wt. (lb.)	Orbital Altitude (NMI)	Launching Azimuth (°)	Stabilization Type
1. Thor-Able*	May '59	225	500	44	Spin
~~2. Thor-based~~	~~Aug. '59~~	~~350~~	~~300~~	~~44~~	~~Spin~~
3. Thor-Able*	Sep. '59	225-350	500-300	44	Spin
4. Thor-based	Oct. '59	240	250	180	Complete
5. Thor-based	Oct. '59	350-650	300-400	45	Spin
6. Thor-based	Nov. '59	650	300	45	Spin
7. Atlas-based	Dec. '59	500	19,000	90	Rough
8. Thor-based	Jan. '60	650	300	45	Rough
9. Thor-based	Feb. '60	350	500	180	Rough
10. Thor-based	Mar. '60	300	250	180	Complete
11. Thor-based	Mar. '60	240-300 (350)	250 (500)	180	Complete
12. Atlas-based	Apr. '60	Backup for 6, 7, or 8			Rough

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*These vehicles were ordered by ARPA Order No. 17-59, Amendment No. 2; No. 1 is designated for navigation satellite and No. 3 is designated for a cloud cover satellite.

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.

[redacted]

USE FOR URGENT LETTERS ONLY

NAVAL SPEEDLETTER

DO NOT CLEAR THROUGH COMMUNICATION OFFICE

14

(One box must be checked)

☒ REGULAR MAIL ☐ SPECIAL DELIVERY

☐ AIR MAIL ☐ REGISTERED MAIL

CLASSIFICATION

UNCLASSIFIED

IN REPLY REFER TO

Aer-PP-1[illegible]/[illegible]

DATE 11 DEC 1958

TO: Commander,
Wright Air Development Center (WCXES-H)
Wright-Patterson Air Force Base,
Ohio

NAVAL SPEEDLETTER—

Permits dispatch or informal language.

May be sent (1) with enclosures, (2) in a window envelope (size 8¾" x 3⅞"), if contents are not classified as confidential or higher, (3) to both naval and nonnaval activities.

Is packaged 500 sheets of white or of one color: yellow, pink, or green.

Subj: Engine Designation; confirmation of

The designation referenced in Wright Air Development Center's confidential messageform WCXESN-11-7-M of 28 November 1958 is confirmed. It is requested that a copy of the model specification be transmitted to the Bureau of Aeronautics, when available.

COPY TO

BAER, CentDist. (TL-3)

ADDRESS: Department of the Navy
Bureau of Aeronautics
Power Plant Division
Washington [illegible], D. C.

←SENDER'S MAILING ADDRESS

Address reply as shown at left or reply hereon and return in window envelope (size 8¾" x 3⅞"), if not classified as confidential or higher.

CLASSIFICATION

UNCLASSIFIED

U. S. GOVERNMENT PRINTING OFFICE

R&D 1-2

15

~~CONFIDENTIAL~~

HEADQUARTERS
WRIGHT AIR DEVELOPMENT CENTER
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Wright-Patterson Air Force Base, Ohio

IN REPLY ADDRESS
COMMANDER, ATTENTION:
WCLPRN

9 JANUARY 1959

SUBJECT: (U) Model Designation for WS-117L Engine

TO: Headquarters
Air Research and Development Command
United States Air Force
Air Force Ballistic Missile Division
ATTN: Lt. Col. E. F. Blum, WDZWS
5760 Arbor Vitae Street
Inglewood, California

1. The model designation "~~(C)~~ Engine, Rocket XLR81-BA-5" was approved on 19 December 1958.

2. The model designation and manufacturer are classified CONFIDENTIAL to comply with the "Security Classification Chart" of AFR 205-49 which was in effect at the time the model designation was requested.

3. A copy of the model specification has been requested by the Bureau of Aeronautics. A copy of the Naval Speed Letter confirming the model designation and requesting the model specification is inclosed.

FOR THE COMMANDER:

C. W. SCHNARE
Chief, Liquid Propellant Rocket Branch
Rocket Propulsion Division
Propulsion Laboratory

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

1 Incl.
Naval Speed Ltr,
11Dec58, (U) 1Cy.
filed under date

Answered
3 Feb 59

~~CONFIDENTIAL~~

~~[illegible]~~ORDINATION SHEET

Rd D 16

~~CONFIDENTIAL~~

... OF ORIGIN ... ENTER OFFICE SYMBOLS IN THE ... BLOCKS IN ... OF DESIRED ...NATION

... COORDINATING WILL ENTER NAME AND DATE IN APPROPRIATE BLOCK

Request for CCN for Contract AF 04(647)-97

~~LBJ~~ WDZWS JAN 15 1959
ATTN: Mr. Silberman Lt Col Blum/lkg/2741

1. It is requested that a CCN be prepared authorizing LMSD to subcontract with Bell Aircraft for a study and test program to investigate parameters and methods required to provide a restart capability for the LR81-Ba-5 engine. This study shall cover dual start and multi-start investigations, including preliminary design. An altitude test program will be conducted by Bell at AEDC to provide required design information. Bell shall prepare a current test engine, to be designated by LMSD, for testing with required instrumentation, plumbing, tankage and pressure regulation equipment.

2. It is estimated that this program will cost $240,000 and should be completed in three months. Cost breakdown is as follows:

Study	$ 50,000
AEDC Test Program	135,000
Manufacturing Extras	40,000
Propellants	15,000
	$240,000

3. This program is a new requirement and should be considered outside the scope of the present contract.

FREDERIC C. E. ODER
Colonel, USAF
Deputy Director for WS 117L

for HARRY L. EVANS
Colonel, USAF
Director for WS 117L

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

82

TO: WDZ
NAME:
DATE:

OFFICIAL FILE COPY

~~[illegible] WDZH~~
Office of Record

OFFICE OF ORIGIN: WDZWS/1	TYPIST: 1kg-14 Jan 59
SIGNATURE: Lt Col Blum	PHONE NO.: 2741

TEMPORARY ☐ PERMANENT ☐

DATE OF DISPOSITION

AFBMD Form 11 AIR FORCE (DPS, Ogden, Utah)

atlas/agena

~~CONFIDENTIAL~~

~~SECRET~~

R+D 1-3-3

18

LBJ

20 January 1959

SUBJECT: Back-up Photovoltaic APU Design

TO:
Lockheed Aircraft Corporation
Missile Systems Division
ATTN: Mr. J. H. Carter
3251 Hanover Street
Palo Alto, California

1. The MIDAS and Sentry development plans submitted by LMSD on 16 January show primary reliance for secondary power on photovoltaic solar energy converters. The future of these programs is acutely sensitive to successful solar APU design. Because of the importance of this area, our present inexperience with it, and the innumerable design approaches which suggest themselves, it is desired that your efforts be expanded to minimize the risk of failure or delay.

2. In view of the above, it is desired that LMSD, while continuing present in-house work, engage a subcontractor for independent pursuit of a back-up photovoltaic solar APU. The objective of such subcontract should be the design of a complete APU compatible with the performance requirements and physical limitations of the MIDAS and Sentry vehicles. It should include construction of a full scale model, although the solar cell installation need not be complete. Since it is intended that new talents be applied to the problem, a highly competent subcontractor not now collaborating with LMSD on solar development should be sought.

3. Your prompt submittal of a proposal and cost breakdown to accomplish the backup design herein request is desired, on or before 5 February 1959.

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

SIGNED
EUGENE S. SILBERMAN
Contracting Officer

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BALLISTIC MISSILES CENTER
AIR MATERIAL COMMAND
ATTN LBJ /R KILDOO/
PO BOX 262
INGLEWOOD CALIF

INFO/ AIR FORCE PLANT REPRESENTATIVE
LAC/MSD
SUNNYVALE CALIF.
UNCLASSIFIED. IN REPLY REFER TO LMSD/500843.
REQUEST QUANTITY ON ITEM NO. 116 BE EXPANDED FROM FOUR /4/ EACH TO SEVEN /7/ EA. IT IS REQUESTED THAT THREE /3/ EA 4520-508-6496 HEATER, AIRCRAFT, BE SUPPLIED AS GFE TO PROVIDE HEAT FOR FLIGHT VEHICLES AT THE LAUNCH COMPLEX AT VAFB, ONE /1/ FOR EACH OF TWO /2/ PADS AND ONE /1/ STANDBY. NEED DATE, AS SOON AS OBTAINABLE. JUSTIFICATION BASED ON NEARNESS OF LAUNCH PADS TO OCEAN AND THEY ARE CONTINOUSLY EXPOSED TO THE ELEMENTS. RELATIVE HUMIDITY AT THE BASE IS FORTY /40/ DAYS AT 40 PERCENT, ONE HUNDRED SEVENTY-FIVE /175/ DAYS AT 60 PERCENT, AND ONE HUNDRED TWENTY-FIVE /125/ DAYS AT 95 PERCENT OR MORE. THIS CAUSES CONDENSATION IN VEHICLES AND PRESENTLY NECESSITATES HAULING VEHICLES ABOUT A MILE AND ONE HALF BACK TO THE MISSILE ASSEMBLY BLDG. TO BE DRIED OUT. RAIN, FOG AND SALT SPRAY PRESENT A CONTINOUS PROBLEM. SHIP TO AFH 1711, LOCKHEED AIRCRAFT CORPORATION, MISSILE SYSTEMS DIVISI VANDENBERG AIR FORCE BASE, ATTENTION HARRY LISTER, WITH A COPY OF SHIPP DOCUMENT FORWARDED TO AFH 1766, LOCKHEED AIRCRAFT CORPORATION, MISSILE SYSTEMS DIVISION PO BOX 504 SUNNYVALE CALIFORNIA ATTENTION GOVERNMENT PROPERTIES GROUP, D/67-72
R E HARDING
LOCKHEED MISSILE SYSTEMS DIV
912A KH

Concurred in by
Capt Patton

ACK PLS
ACK 1 MS TGGG TK SS OUT

BMC

Atlas/Agena

COPY NO. 20

MISSILE SYSTEMS DIVISION

Ref: 3-590-ML

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In reply refer to:
LMSD/428961/62-23

2 February 1959

DOWNGRADED AT 3 YEAR INTERVALS;
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DOD DIR 5200.10.

Subject: Contract No. AF 04(647)-97
Back-up Photovoltaic APU Design

To: Commander
Hq. Ballistic Missiles Center
Air Materiel Command
Attention: LBJ, E. S. Silberman
Air Force Unit Post Office
Los Angeles 45, California

References: (A) BMC letter to LMSD, Ref: LBJ, "Back-up Photovoltaic APU Design," dated 20 January 1959, (LMSD 421541)

1. This is in reply to Reference A concerning a parallel development program for the design of a full scale operational solar photovoltaic APU.

2. The importance of the solar APU to the Midas and Sentry vehicle systems is well understood, and therefore, this system has been the subject of intensive development over the past two years. This development has been followed within the [illegible] Division as well as through the efforts of LMSD R&D Branch. A subcontract has been initiated also with Hoffman Electronics for the development and fabrication of solar collector array elements suitable for initial test flights. This contract has been brought to a successful conclusion with the delivery of articles meeting the electrical and environmental requirements of the development and qualification test specification.

3. The importance of this type of APU to space vehicle operation in general is recognized throughout the country and has lead to cooperation and information exchange between LMSD and other major space vehicle manufacturers and component laboratories. We have established information exchange with WADC, the Signal Corp Engineering Laboratory, ABMA, NASA, RCA, Boeing, North American, and [illegible]. It is the objective of this information exchange to assure rapid and reliable development of the solar APU for Sentry as well as to promote the overall national advancement in power supplies of this type.

~~CONFIDENTIAL~~

59 LBM 12558

Ref: 3-590-ML

Subject: Contract No. AF 04(647)-97
Back-up Photovoltaic APU Design

WDD/422961/62-23
2 February 1959

~~CONFIDENTIAL~~

4. The exchange of information and the detailed design development within LMSD has at the present time evolved in two detailed designs. First, a test system installation which includes collectors of several types fully instrumented for electrical and thermal performance and including an integrated telemetering system capable of furnishing performance information for an extended flight time. This test APU will establish conclusively performance of the solar photovoltaic APU type. The second design is a 200 watt installation for universal application in the Sentry and Midas vehicles. This installation is closely integrated into the vehicle structure and specifically designed to supplement the moment of inertia requirements of the attitude control system.

5. A strict engineering analysis of this operational flight design is now in progress with initial indications that parallel approaches may be desirable in two design areas. Namely, the packaging of expandable arrays into small volume with actuators of maximum reliability, and full orientation control with minimum power requirements, high reliability, and without effect on vehicle attitude.

6. The desirability of initiating independent subcontractor study effort or supplementary LMSD R&D Branch study effort in the above two areas has been considered and such possibilities have been discussed with the prospective contractors. Funding limitations, however, have prevented the initiation of such parallel effort up to this time.

7. Due to the close integration requirements of the solar APU collector panels within the vehicle structure and the affects of the solar array upon vehicle performance and attitude control, we would like to recommend that the parallel effort recommended in Reference A be limited to the study areas noted above. Supplementary study effort in these two problem areas is desirable to provide LMSD and the Air Force with assurance that the final system is one of the highest performance and reliability.

8. Design of a full scale complete system back-up, together with the fabrication of a functional model may not be essential in view of the effort already expended, the advanced state of the present design, and the necessity of fully acquainting a subcontractor with the complete Sentry vehicle performance factors essential to completing such a design.

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WD-59-01158

Ref: 3-59C-ML

~~CONFIDENTIAL~~

Subject: Contract No. AF 04(647)-97
Back-up Photovoltaic APU Design

LMSD/422961/62-23
2 February 1959

302

The cost involved is also of some consideration since the initiation of such a contract must be considered a major, and therefore, costly effort. Would you therefore kindly advise your concurrence or rejection of the above LMSD recommendations. Pending reply, work statements and costs are being prepared for both the study program and the parallel design effort.

Very truly yours,

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

for
W. M. Hawkins, Manager (Acting)
Sentry Weapon System

JHC/CWB:jn
cc: Air Force Plant Representative
Col. H. L. Evans
Major G. E. Austin

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21

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COORDINATION SHEET

[redacted] ~~CONFIDENTIAL~~

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DECLASSIFIED AFTER 12 YEARS.
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COMDR, AFBMD, ARDC, LOS ANGELES, CALIFORNIA

DIRECTOR
ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

~~CONFIDENTIAL~~ FROM WDZWS 2-4-E. SUBJECT: LMSD PROPULSION STAGE. IN ACCORDANCE WITH DISCUSSION BETWEEN LMSD AND ARPA ON 5 FEB 59, THE FOLLOWING ROUGH ORDER OF MAGNITUDE COSTS ARE PRESENTED FOR CONFIGURATION: 1a(1), 1a(2), 2a(1) and 2a(2) OF LMSD 48595 DATED 2 FEB 59, AS DISCUSSED WITH R. CANRIGHT. PRODUCTION COSTS OF THE VEHICLES INCLUDING DUAL BURNING: UNIT COST PRODUCTION RATE OF 6/YR $460,000; UNIT COST PRODUCTION RATE OF 12/YR $420,000. LMSD TIMES FOR 1a(1) WITHOUT DUAL BURNING IS 7 MONTHS AND 12 MONTHS WITH DUAL BURNING. ALL OTHER CONFIGURATIONS 12 MONTHS WITH OR WITHOUT DUAL BURNING.

[redacted]

[illegible] THE FOLLOWING R&D COSTS FOR EACH CONFIGURATION NOTED ARE REQUIRED:

1. UNMODIFIED PROPULSION SECTION

9 Feb 1959

SIGNED

[redacted]

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Office of Record

HARRY
Colonel

OFFICE OF ORIGIN:
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DICTATOR:
PHONE NO:
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AFBMD Form 11

AIR FORCE (DPS, Ogden, Utah)

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, AFBMD, ARDC, LOS ANGELES, CALIFORNIA

1a(1)	PRESENT TANKAGE (100%)		
	DUAL BURNING	R&D COSTS	$2,300,000
1a(2)	INCREASED TANKAGE (130%)		
	DUAL BURNING	R&D	2,300,000
	INTEGRAL TANKS (Including PTVA)	R&D	2,150,000
		TOTAL R&D	$4,450,000
2.	MODIFIED PROPULSION SECTION		
2a(1)	PRESENT TANKS (100%)		
	DUAL BURNING	R&D	$2,300,000
	MODIFICATION COSTS	R&D	750,000
		TOTAL R&D	$3,050,000
2a(2)	INCREASED TANKAGE (130%)		
	DUAL BURNING	R&D	$2,300,000
	INTEGRAL TANK (Including PTVA)	R&D	1,700,000
	MODIFICATION	R&D	750,000
		TOTAL R&D	$4,750,000

IT SHOULD BE NOTED THAT THE COST FOR THE INTEGRAL TANK R&D IN 2a(2) IS REDUCED IN COST FROM 1a(2) BECAUSE OF A SAVINGS EFFECTED IN COMBINING THE INTEGRAL TANK WITH THE MODIFICATION R&D.

DUAL BURNING R&D COSTS DO NOT INCLUDE PTVA, PTVA TESTING, AEDC TESTING OR DELIVERED ENGINES WHICH HAD BEEN INCLUDED IN THE $4,500,000 FIGURE GIVEN TO YOU DURING YOUR VISIT TO AFBMD.

IF SIMPLIFIED GUIDANCE AND FLIGHT CONTROL SYSTEM IS DESIRED, ADD $100,000 to R&D PLUS $90,000 TO THE UNIT COST. THIS SIMPLIFIED GUIDANCE AND FLIGHT CONTROL SYSTEM CHANGES THE CONFIGURATION 1a(1)

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AIR FORCE (DPS, Ogden, Utah)

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COORDINATION SHEET

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CMDR, AFBMD, ARDC, LOS ANGELES, CALIFORNIA

PERSON COORDINATING WILL ENTER NAME AND DATE IN APPROPRIATE BLOCK

1a(2), 2a(1) AND 2a(2) TO 1b(1), 1b(2), 2b(1), AND 2b(2) RESPECTIVELY OF LMSD 48595.

GROUND SUPPORT EQUIPMENT COSTS TO SUPPORT 1a(1), 1a(2), 2a(1) AND 2a(2) ARE $600,000. THIS INCLUDES CHECKOUT OF EQUIPMENT AT THE PAD AND BLOCKHOUSE. TO SUPPORT 1b(1), 1b(2) AND 2b(1) AND 2b(2), GSE CPSTS WILL BE $1,000,000. GSE COULD BE AVAILABLE WITHIN EIGHT MONTHS FROM GO AHEAD.

THESE COSTS WOULD PROVIDE MINIMUM SUPPORT REQUIRED FOR 17-59 TYPE FLIGHTS. GSE, BEING FABRICATED NOW FOR MIDAS PROGRAM AT AFMTC IS CURRENTLY PROGRAMMED FOR USE THRU MAY 1960, IS CAPABLE OF USE WITH THE ABOVE CONFIGURATIONS AND COULD BE USED FOR THESE FLIGHTS SUBSEQUENT TO THAT DATE.

33

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FEB 16 1959

MEMORANDUM FOR COLONEL CURTIN

SUBJECT: (U) Photovoltaic Solar Cell Research

1. The accompanying letter to General Anderson for General Schriever's signature requesting impetus on photovoltaic solar cell research is occasioned partly by accelerated MIDAS requirements and partly by previous contacts with WADC which have not elicited the response desired.

2. On 25 July 58, we queried (with copy [illegible] ARDC) WADC on its research and development program for photovoltaic solar energy conversion. The inquiry was made when it was [illegible] that a promising research proposal for a composite gap photovoltaic material had been rejected for budgetary rather than technical reasons. We suggested that the importance of this area might not be fully appreciated and cited our considerable dependence upon it. We urged that sound approaches for improvement of solar cell performance be given every consideration.

3. WADC did not reply to our letter for three and one-half months, and then only after further inquiry on its status. On 7 Nov 1958 they outlined a program which was extremely weak:

a. Of a dozen promising photovoltaic materials, WADC was investigating only cadmium sulfide, in a program which had been originated by the WS 117L Project Office and funded by that office in FY 57 and FY 58.

b. Bids for improved solar cells were about to be solicited from six or more companies, but subsequent information revealed plans to support only one, in spite of the fact that the variety of approaches easily justified multiple efforts.

c. The only additional work programmed involved the construction of a 500 watt photovoltaic solar APU for ground demonstration purposes. Since we are currently building a 200 watt operational flight unit, we do not regard this as leading research.

4. On 21 and 22 January, prior to an Air Force Secondary Power Program briefing to ARPA, this matter was again discussed between Hq ARDC, WADC, and AFBMD personnel. It was concluded by all that solar cell research should be expedited. To insure proper support, our representative agreed that a letter projecting quantity requirements and stating the need for improved performance would be sent from AFBMD to Hq ARDC.

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

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4. Simultaneously, through LBJ, a request has been initiated for establishing a manufacturing methods project through WADC, consistent with the DX priority of using programs.

SIGNED

HARRY L. EVANS
Colonel, USAF
Director for WS 117L

~~CONFIDENTIAL~~

OFFICE OF ORIGIN: WDZWS	TYPIST: lkg-13 Feb 59	
DICTATOR: Major Austin	PHONE NO: 2741	

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AFBMD Form 11
17 Sept. '57

Austin

AIR FORCE IDPS, Ogden, Utah

COORDINATION SHEET

Rd D1-223

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PERSON COORDINATING WILL ENTER NAME AND DATE IN APPROPRIATE BLOCK

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6 March 1959

WDZW

MEMORANDUM FOR LT COL BATTLE

SUBJECT: Dual Burn Engine Capability

Confirming my verbal instructions of last week, I would like you to establish a firm development program leading to the achievement of a dual burning capability for the Midas program. This dual burn capability should be started immediately as a study program and be time-phased to permit flight test of this engine no later than July of 1960, and preferably prior to that time, funds permitting.

I should like to review this program with you on 13 March 1959.

SIGNED

Cy furnished:
Lt Col E. F. Blum

HARRY L. EVANS
Colonel, USAF
Director for WS-117L

91

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DICTATOR:
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AFBMD Form 17

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24

9 MAR 1959

WDZW

Major General D. J. Keirn
Chief, Aircraft Nuclear Propulsion Office
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear General Keirn:

In your letter of 2 February you have requested an indication of requirements for radioisotope thermoelectric generators. I should like to defer stating a requirement for generators of that type until the relative desirability of reactor sources, as detailed in the attached study, can be directly discussed between our representatives. The study reflects thinking which has evolved regarding SNAP units for WS 117L vehicles. Our concepts may be altered for other applications, but these have not yet been considered to the extent that definite requirements can be indicated.

The firming of WS 117LP specifications, together with the variety of SNAP systems now discernable, brings us to a point at which the relationship between these programs should be reviewed and possibly redirected. The advisability of deleting SNAP I from further consideration and the objectives for SNAP II, as well as the selection of a reactor or radioisotope fuelled thermoelectric generator, require clarification and mutual agreement. The extent to which other programs may influence design objectives or introduce new requirements remains to be determined. I am instructing my staff to take up these matters more fully with your representatives during their forthcoming visit to this Division.

Sincerely,

~~RESTRICTED DATA~~
~~ATOMIC ENERGY ACT 1954~~

SIGNED

O. J. RITLAND
Brig. Gen., USAF
Vice Commander

1 Incl:

~~SECRET~~

(retype)

WDZW 59-197
Cy 3 of 4

Major Austin

~~SECRET~~

SELECTION OF SUBKILOWATT SNAP POWER SUPPLY

A selection between alternative SNAP power supplies to meet WS 117L requirements in the subkilowatt range appears to be desirable at this time. These requirements, as presently identified for both Sentry and MIDAS programs, will be satisfied by continuous power of 250 watts at the output terminals of a 28 volt direct current generator. A minimum operating duration of one year is specified, but even longer life is desired if attainable. This is particularly true for MIDAS vehicles which are required in quantity. A capability of this nature is desired by mid 1961.

It is to be hoped that long enduring power in the range of several hundred watts can be furnished by solar generators, and they are regarded to be the primary approach. Solar units compare favorably with SNAP units in performance and weight and circumvent radiological difficulties. Their reliability under operating conditions is yet to be established, however, and may well be the issue which ultimately dictates the choice between SNAP and solar power supplies. Since the entire feasibility of MIDAS and the attractiveness of Sentry depend upon prolonged operating life, it is essential that a back-up SNAP development be vigorously pursued.

In an April 1958 letter to the Aircraft Reactors Branch, and in subsequent minutes of SNAP Coordinating Committee meetings, AFBMD preference has been indicated for a subkilowatt reactor with static converter over a like radioisotope-fuelled unit. The reactor envisioned, substantiated in concept by a recent Atomics International study, is without heat transfer fluids, pumps, or even reactivity controls, although these could be introduced in the interest of improved design. Its inherent simplicity permits orbital startup, eliminating operational and handling problems associated with a ground started reactor or with radioisotope fuels. The reactor need never be started on an aborted mission. An operating lifetime of several years appears likely, and the unit will not perish in storage. These advantages are extremely attractive from a systems point of view and give pause in considering any commitment to radioisotope sources.

Reservations concerning development time for such a reactor have been expressed by the Aircraft Reactors Branch. In reporting on feasibility, however, Atomics International has indicated that a prototype reactor heat source could be designed and built in approximately one year in a minimum cost program. This expectation does not appear unduly optimistic in view of the direct adaptability of fuel element technology developed for SNAP II, and also in view of the simplicity of the device. The most critical technical problems identified involve [illegible]

[illegible]

WDZN 59-187
Cy 3 of 7

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~~ATOMIC ENERGY ACT 1954~~

The attractiveness of radioisotope supplies to meet WS 117L requirements is diminished by the necessity for massive biological shielding which must be retracted from the vehicle just prior to flight and reinstalled in the event of a hold requiring personnel access. Reference is made, for example, to the SNAP I design which utilizes 7200 pounds of drainable mercury. While it is probable that booster static load limitations can be overcome to accommodate this additional weight, and that operational techniques can be perfected, motivation to introduce such additional complexity is weakened by the relative desirability of other solutions.

Radiological considerations also influence the choice of SNAP generators. In the case of cerium sources, the remarkable progress toward containment under every conceivable circumstance reduces the magnitude of radiological hazards by precluding the possibility of dispersal in populated areas. While catastrophic incidents are thus averted, lesser but nevertheless objectionable hazards remain. The appreciable range of external radiation emitted from an intact source constitutes an insidious danger with inevitable adverse political and sociological consequences. The necessity for recovering such sources, or for continued surveillance of impact areas, creates a burdensome operation and an impasse when re-entry occurs in foreign territory. Problems such as these have yet to be evaluated by the SNAP Hazards Subcommittee recently formed for that purpose with membership from appropriate governmental agencies. In preliminary discussions, however, reluctance to accept re-entry of SNAP sources, even if intact, was evident. Avoidance of re-entry altogether by orbital nuclear destruct, high altitude burnup, or other means introduces unknowns which prevent an evaluation at this time of the effectiveness of such methods and their effect upon system design and performance.

High altitude dispersal of nuclear material upon impact with the atmosphere is more likely to have the required fail-safe characteristics than a nuclear destruct device, actuation of which is fallible. While design for atmospheric burnup of radioisotopes may be inconsistent with the requirement for integrity in the event of a launch site accident or during ascent, it presents no such difficulty with reactors which initially contain negligible contaminant, or no contaminant at all if orbitally started. Although reactors thus appear to be more adaptable to this approach, successful design to accomplish high altitude dispersal cannot be presumed. This problem should be given immediate attention, since conviction regarding use of reactors must remain qualified as long as a question exists regarding fission product disposal.

~~CO[redacted]AL~~

gm 25

17-59

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59
Amendment No. 4

April 10, 1959 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

40

ARPA Order No. 17-59, dated September 4, 1958, as amended, is hereby further amended to specify the approved Tasks included therein.

Transferred to NASA see amendment #5

Task No. 1 - Provide one THOR-based vehicle for the TIROS project. The specifications for this vehicle, its launch schedule, and other matters will be specified by NASA. Of the funds provided in this Order, $2 million pertain to this Task for covering estimated costs already incurred. Tiros

See Arpa Order 95-60 — Task No. 2 - Develop an upper stage vehicle AJ10-104. Estimated cost, $1,708,000. Able-Star

See Arpa Order 96-60 — Task No. 3 - Modify the Bell-Hustler stage to obtain dual burning capability, simplify guidance and control system, structural simplification such that payloads of arbitrary shapes may be carried, and increased propellant carrying capacity. Estimated cost, $5,150,000. Agena

See ARPA Order 97-60 — Task No. 4 - Provide for the delivery and launching at AMR of a THOR-Delta and a THOR-104 suitable for the injection of the Transit payloads of about 215 pounds into 400 N. Mi. high circular orbits. Estimated cost, $7,630,000. Transit

See ARPA Order 95-60 — Task No. 5 - Provide for the delivery and launching at AMR of two THOR-104 vehicles suitable for the injection of the 500 pounds Courier payloads into 650 N. Mi. high circular orbits. Estimated cost, $7,994,000. Courier (able star)

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ARPA Order No. 17-59
Amendment No. 4

See ARPA Order 97-60

Transit 2

Task No. 6 - Provide for the delivery and launching at PMR of two THOR-Hustler (modified) vehicles suitable for the injection of the 215-pound Transit 2 payload into 400 N. Mi. high circular orbit. Estimated cost, $7,660,000.

The desired launch schedule for Tasks Nos. 4, 5, and 6 is set forth in Attachment No. 1 to this Amendment.

The Tasks listed above supersede paragraphs 1, 2, and 3 of Amendment No. 3, dated November 26, 1958.

The estimated total cost of Tasks Nos. 2 through 6 is $30,142,000.

The fund availability under ARPA Order No. 17-59 is hereby increased from $5,090,000 to a new total of $18,300,000 under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Department of Defense." Additional funds for Tasks No. 2 through 6 will be made available upon the availability of FY 1960 funds.

It is requested that development and funding plans be submitted for Tasks Nos. 2 through 6 as soon as possible.

Roy W. Johnson
Roy W. Johnson
Director

1 Incl.:
Attachment No. 1
(Launch Schedule)

Copy to: Secretary of the Air Force
Administrator, NASA

~~[redacted]~~

Attachment No. I

ARPA Order No. 17-59
Amendment No. 4

LAUNCH SCHEDULE, TASKS Nos. 4, 5, and 6

Project	N.M.	P/L Wgt.	Range	FY 1959										FY 1960					
				CY 1959										CY 1960					
				M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Transit 1 a	400	215	A						TD										
Transit 1 b	400	215	A												TE				
Transit 2 a	400	215	P													TH			
Transit 2 b	400	215	P																TH
Courier 1 a	650	500	A											TE					
Courier 1 b	650	500	A														TE		
Combined Schedule									TD					TE	TE	TH	TE		TH
At AMR									TD					TE	TE		TE		
At PMR																TH			TH

TD - Thor Delta
TE - Thor 104
TH - Thor Hustler (Mod.)

Each b is a backup. In case of successful first launch, the backup would be rescheduled.

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59
Amendment No. 5

April 13, 1959 Date

43

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

Pursuant to an Agreement between the Department of Defense and the National Aeronautics and Space Administration (copy attached), the responsibility for the technical and management direction for the THOR-based booster for the meteorological satellite project, designated TIROS, as specified in Task No. 1 of Amendment No. 4 to ARPA Order No. 17-59, dated September 4, 1958, as amended, has been transferred to the National Aeronautics and Space Administration.

Accordingly, the ARPA reporting requirements pertaining to Task No. 1 of Amendment No. 4 to ARPA Order No. 17-59, dated September 4, 1958, as amended, are terminated. Title to facilities and non-expendable equipment procured under Task No. 1 will be determined upon completion of the work in accordance with the Agreement.

You are authorized to use funds remaining on Task No. 1 for the work as directed by NASA, in accordance with the Agreement, but ARPA assumes no responsibility for obligations and expenditures in excess of $2,000,000.

Roy W. Johnson

Roy W. Johnson
Director

1 Inclosure (Addressee only)

~~CONFIDENTIAL~~

R 8D127

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION · SUNNYVALE, CALIFORNIA

In Reply Refer To:
LMSD/430045-23-06

14 April 1959

DOWNGRADED AT 3 YEAR INTERVALS;
DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

Subject: Analytic and Stability Studies of WS117L Flight Control Section

To:
Commander
Air Force Ballistic Missile Division
Hq., Air Research and Development Command
Detachment #2 (FBMD)
Attn: WDZWS, Col. H. L. Evans
Air Force Unit Post Office
Los Angeles 45, California

Reference: (A) TWX WDZWS 3-33-E to W. E. Frye dated 28 March 1959 (LMSD/427599) Same subject

1. In response to your request per Reference (A) above, LMSD is pleased to submit a report of the previous analytical studies performed as follows:

- (a) Single axis stability margins (pneumatic and Hydraulic operation)
  - (1) attitude control only
  - (2) horizon scanner plus attitude control
- (b) Two degree of freedom study orbital boost phase, (fuel slosh, flexible missile, engine dynamics, compliant engine mount, jet damping, hose restraints, fuel slosh damping ratio parameter study, etc.)
- (c) Pitch-roll coupling (pneumatic operation)
- (d) Yaw-roll coupling with horizon scanner
- (e) Hydraulic servo study for engine control
- (f) Effects of gas valve dynamics
- (g) Gas consumption on orbit (limit cycles) effects of: valve threshold and hysteresis, horizon scanner operation, retro rockets, etc.
- (h) Effects of turbine windup torque in roll
- (i) Effects of thrust misalignment correction
- (j) Improved static accuracy with "integral" network
  - (1) engine servo with position plus rate feedback

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THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE

[redacted]

(k) Rate circuitry to replace rate gyros

(l) Flight simulations with vehicle hardware, i.e., hydraulic engine servo, IRP, rate gyros, sequence timer, gas valves

(m) Dynamic checkout of vehicles with actual hardware

(n) Tolerance analysis (incomplete)

(o) Post flight analysis

(p) Five degree of freedom study - fuel slosh coupling among axes

2. The future work load will include the following studies:

(a) Horizon scanner simulation - an actual hardware simulation with the attitude loop closed around the H/S, thus giving a close measure of vehicle accuracy, limit cycles and coupling of axes.

(b) Gas valve plus inertia damper system - this is a dual force level type of control for extended operation with minimum energy expenditure.

(c) Sentry reconnaissance system studies - an investigation of the effects of the attitude control system on extended operation.

(d) Error analysis - a study of the effects of system tolerances on vehicle accuracy.

(e) Five degree of freedom with vehicle hardware.

3. Analog and digital studies of the vehicle with the effects of the first bending mode included have been performed. The digital program is a two degree of freedom system which can include the characteristics of the first five body bending modes and the backup structure. The analog program was a simplified version of this in which the servo is represented by a second order system and only one bending mode was considered. Both studies indicated that, for the calculated mode shape and frequency, bending effects are negligible. These effects have been eliminated from subsequent studies of the present configuration although future configurations will be checked for the effects of the bending modes.

S DOCUMENT CONTAINS INFORMATION AFFECT-

[redacted]

4. Effects of Flexure on Autopilot Operation - Flight #1022 - The most violent manuever during flight occurred in the pitch plane immediately following ignition. Maximum pitch attitude and rate excursions during this period reached approximately 17 degrees and 40 deg/sec respectively. During this period the engine rotated to its maximum displacement and, in addition, the thrust overshot its nominal value by approximately 20%. These conditions are more severe than those encountered during any other phase of the flight and bending effects, if any, would be evident at this time.

5. The frequencies of the first five bending modes are approximately 39, 49, 53, 87 and 94 cps respectively. Although the gyros are sensitive to bending slopes, the telemetering commutation rate of five samplings per second for these channels is too low to detect the bending effects on the telemetered gyro records. Bending oscillations are evident on the accelerometer records however, since these channels are continuously telemetered. Normal (perpendicular to longitudinal axis) accelerometer instrumentation data are as follows:

Channel	Instr.	Instr. Location	Instr. Freq. Resp.	Telemetering Freq. Resp.
10	A1	M.S. 316	100 cps	80 cps
8	A3	M.S. 409	100 cps	45 cps

These channels are capable of recording the most important bending modes but are not sufficient to distinguish between the first three modes since their frequencies are so similar.

6. Channel A3 indicated a frequency of approximately 45 cps which may be the first bending mode. These oscillations had a maximum value of approximately ± .9 g's which, at this frequency, would represent a bending displacement of approximately .004 inches. The amplitude decayed to the noise level within .3 seconds, exhibiting a structural damping ratio of approximately .003. No other significant bending oscillations were noted during any other pahses of flight.

7. Bending vibrations affect the operation of the vehicle in two ways:

(a) The attitude and rate gyros detect bending slope and feed this information into the autopilot as erroneous attitude signals

(b) The gimbal structure undergoes an angular displacement when the missile bends, thus deflecting the engine with respect to the center of gravity of the vehicle and producing rotational oscillations.

IS DOCUMENT CONTAINS INFORMATION AFFECT-

~~[illegible]DENTIAL~~

8. The static gain and frequency-attenuation characteristics of the autopilot are such that a signal of this frequency would be attenuated by factors of approximately .002 and .0002 for the attitude and rate channels respectively. On this basis, the bending slope must be greater than approximately .13 degrees to exceed the engine closed loop dead band of approximately .01 degrees. The Structural Dynamics Group computed a maximum bending slope of approximately .02 degrees for a 4 degree step deflection of the engine. It is evident the combination of attenuation and deadband will completely nullify bending effects. On the basis of the preceeding analysis and the telemetered records it was concluded the control system was not susceptible to structural feedback.

9. The backup structure bending mode was observed during static firings to be approximately 20 cps. This frequency could not be observed on the telemetered actuator position channels because the telemetering sampling rate was only eight samples per second. This frequency was not observed on the accelerometer channels and therefore it is concluded the backup structure deflection was negligible.

10. Maximum engine deflections of approximately .5 degrees in each axis were recorded during static engine starting tests. The telemetered starting transients were considerably greater than this and completely masked the effects of engine compliance. A post flight analog simulation of the engine transients at this time indicated the probable cause of the erratic behavior was a spurious malfunction of the Hydraulics or Electronics Package rather than excessive engine compliance.

LOCKHEED AIRCRAFT CORPORATION
MISSILES AND SPACE DIVISION

for R. Smelt, Manager
XA Weapon System

RS:RWB:er

cc: A. F. Plant Representitive, Sunnyvale

IS DOCUMENT CONTAINS INFORMATION AFFECT-

atlas/agena

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LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION • SUNNYVALE, CALIFORNIA

COPY NO. E 1

1-3-5

28

In reply refer to:
LMSD/430100
Dept. 23-06

2 May 1959

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

Subject: Contract AF 04(647)-97
Solar APU Backup Program

To: Commander
Air Force Ballistic Missile Division
Headquarters Air Research & Development Command
Attn: WDZW, Col, H. L. Evans/Maj. Geo. Austin
Air Force Unit Post Office
Los Angeles 45, California

Enclosure:
(a) Hughes Aircraft Development Proposal (3 copies)
(b) Radiation, Inc. Development Proposal (3 copies)
(c) AiResearch Manufacturing Division Development Proposal (3 copies)
(d) Westinghouse Electric Corporation Development Proposal (3 copies)

1. Enclosures (a) through (d) are transmitted herewith for evaluation by AFBMD as a possible backup program to the current Photovoltaic work being done under the subject contract.

2. The evaluation of these proposals by LMSD is as follows:

Hughes Aircraft

The Hughes development proposal, priced at $174,959, includes the development of a fully oriented array system, servo controlled. The mechanism of stowage and extension appears reasonable with a high probability of satisfactory development. Orbit and system design parameters appear reasonable and the power drive arrangement appears excellent from the standpoint of the absence of high speed motor components. The proposal does include a more conventional motor drive development in the event the unique electro-magnetic drive system would not prove adequate. The facilities, personnel, capabilities, and financial responsibility of the Hughes Company is, of course, excellent.

Radiation, Inc.

The Radiation, Inc. proposal, priced at $184,720, is excellent from the standpoint of a solar auxiliary power system theoretical study. The approach taken is more inclusive than Hughes from the standpoint of a comparison of a static semi-dynamic and fully oriented system. This should not, however, be construed as a reflection on the Hughes quotation since conclusions drawn by Lockheed and other companies are that the area of static system is too large to be considered completely feasible. In spite of the rather complete proposal

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of Radiation, Inc., there are major mechanical problems that are not shown in sufficient detail to establish a superiority of capability to Hughes. These two areas are listed as follows:

(a) The requirement for high speed torque motors to accomplish orientation is not considered completely practical for the lifetimes involved.

(b) The conversion from DC to AC power on the solar collector panels for transmission of electrical power through the bearings by means of transformer coupling or condenser coupling is not sufficiently described in detail to permit evaluation.

The proposal includes effort on secondary battery evaluation and voltage regulator control development which were not part of the work statement requirement.

AiResearch Manufacturing Division

AiResearch Manufacturing Division proposal, priced at $166,469. is rated third, primarily due to the complexity of the [illegible] system and the requirement for high speed motors. The alternative static system requires an exceptionally high degree of reliability in the individual component collectors. This system also does not appear desirable from the standpoint of temperature control. The electrical control system proposed appears excellent for the rather complex control operation required.

Westinghouse Electric Corporation

Westinghouse proposal, priced at $132,469. based the design on the availability of high efficiency cells contrary to the instructions of the work statement. The collector design proposed is of too small an area to be considered or compared with the other proposals received. It should be noted, however, that the unique method of extension, using foaming plastic as a support mechanism, is an excellent idea.

RCA elected to submit no bid.

Electro-Optical Systems Inc. - no bid.

3. The Contractor will supply further comments or discussions concernin the subject backup program, if it is so desired.

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18 U.S.C., SECTIONS 793 AND 794. ITS TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

LOCKHEED AIRCRAFT CORPORATION
MISSILES AND SPACE DIVISION

[illegible] Manager

~~CONFIDENTIAL~~

-97 [illegible]
31-40
LB 1C46

RECEIVED
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ACTION

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204-7 FROM LOCKHEED MSD PALO ALTO CALIF TWX 91 MAY 6 1959 410P
HEADQUARTERS BALLISTIC MISSILES CENTER AIR MATERIEL COMMAND
LOSANGELES CALIF

7 MAY 1959 00 33

INFO

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ATTN LBJP E S SILBERMAN

BT
/~~S E C R E T~~/ LMSD/430932/61-63
SUBJECT CLN .. AMENDMENTS TO CCN NO. 23
TO CLARIFY INTERPRETATION OF CCN NO. 23, DATED 24 APRIL 1959, THE FOLLOWING AMENDMENTS TO CCN NO. 23 ARE HEREWITH REQUESTED. IT IS UNDERSTOOD BY A MEETING APRIL 23, 1959 WITH LT. COL. BLUM THAT BMD CONCURS WITH LMSD"S TECHNICAL INTERPRETATION.

1. INITIATE ACTION FOR A DESIGN AND DEVELOPMENT PROGRAM TO PROVIDE A RESTART /DUAL-BURNING/ CAPABILITY TO A MODIFIED VERSION OF THE LR 81-BA-5 ENGINE.......

2. DESIGN AND DEVELOP SUCH OTHER CHANGES AS ARE REQUIRED TO MAKE THE OTHER PORTIONS OF THE VEHICLE, SUBSYSTEMS AND GROUND SUPPORT EQUIPMENT COMPATIBLE WITH THIS RESTART CAPABILITY...............

AFBM EXHIBIT 58-25 ENTITLED "WS 117L WORK STATEMENT," DATED 10 DECEMBER, 1958, INCLUDED IN THE CONTRACT BY REFERENCE IS TO BE AMENDED AS FOLLOWS CLN

PAGE 46 PARA. 2.5.1.1.1 - REVISED TO READ AS FOLLOWS CLN
ALL FABRICATION AND TEST OF ITEMS UNDER THIS SUBSYSTEM WILL BE DIRECTED TOWARD THE DEVELOPMENT OF A BASIC AIRFRAME ADAPTABLE WITH A MINIMUM OF MODIFICATION TO THE CAPABILITIES LISTED UNDER PARAGRAPHS 2.2.1.1 AND 2.2.2. IN ADDITION TO ADAPTABILITY TO OPTIONAL PAYLOADS, THE AIRFRAME MUST ALSO BE MODIFIED AT THE APPROPRIATE CHANGE POINT TO ACCOMMODATE UDMH AND RESTART PROPULSION SUBSYSTEMS. TANKS WILL ALSO BE REDESIGNED TO ACCOMMODATE THE UDMH AND RESTART PROPULSION SUBSYSTEM REQUIREMENTS. THE AIRFRAME MUST ALSO BE ADAPTABLE TO ALTERNATE BOOSTERS.
PAGE 46 PARA. 2.5.1.1.1.1 - REVISED TO READ AS FOLLOWS CLN
THE DEVELOPMENT OF THE AIRFRAME WILL ENTAIL THE FOLLOWING ACTIVITIES CLN DESIGN OF SPACE UTILIZATION MODEL SMCLN FUNCTIONAL INSTALLATIONS MOCKUP SMCLN A STRUCTURAL TEST VEHICLE TO BE USED FOR STATIC AND DYNAMIC LOAD TESTS, VIBRATION TESTS, ENVIRONMENTAL TESTS, AND AS TEST JIG SMCLN COMPONENT TESTING TO SUPPORT DESIGN SMCLN PTVA AND FTV AIRFRAMES TO BE MODIFIED TO ACCOMMODATE THE UDMH AND THE RESTART ENGINE AT THE APPROPRITE CHANGE POINT SMCLN STUDY AND DESIGN OF THIN WALL TANKS AND DEVELOPMENT OF JP-4, UDMH, AND RESTART CAPABILITY TANKS

~~[illegible] TEST [illegible] TO FTV'S SMCLN OTV ENRBQJUG~~

INTERVALS: NOT AUTOMATICALLY

WILL REPEAT LAST ~~CONFIDENTIAL~~

SMCLN CAPTIVE TEST VEHICLE IDENTICAL TO FTV"S SMCLN OTV ENVIRONMENTA
CONTROL SYSTEM SMCLN OTV DESTRUCT SYSTEM SMCLN WIND TUNNEL MODELS FOR AERODYNAMIC STUDIES SMCLN AND AEROTHERMAL STUDIES.

PAGE 47 PARA. 2.5.2.1.1 - REVISED TO READ AS FOLLOWS CLN PERFORM ALL PHASES OF RESEARCH, DEVELOPMENT, AND TESTING TO PRODUCE THE PROPULSION SUBSYSTEMS TO BE DELIVERED UNDER ITEM II AND DEFINED I 2.2.3.2.1. A PUMP-FED ROCKET ENGINE WILL BE USED SUBSTANTIALLY THE SAME AS THE HUSTLER ENGINE /LR-81/. THIS WILL BE MODIFIED DURING THE PROGRAM FOR THE USE OF UDMH FUEL AND INCREASED NOZZLE AREA RATIO. A MODIFIED VERSION OF THE LR-81-BA-5 ENGINE AS WELL AS DUAL ULLAGE ROCKETS WILL BE DESIGNED AND DEVELOPED TO PROVIDE A RESTART CAPABILI

PRIMARY RESEARCH, DEVELOPMENT, AND FABRICATION OF THE ROCKET ENGINE WILL BE PERFORMED BY BELL AIRCRAFT CORPORATION SMCLN HOWEVER, LMSD WILL BE RESPONSIBLE FOR THE OVERALL SUBSYSTEM DEVELOPMENT.

PAGE 57 PARA. 2.5.4.1.1.1 - REVISED TO READ AS FOLLOWS CLN DEVISE AND DEVELOP A WS 117L "INTERIM GUIDANCE SYSTEM" FOR USE IN ALL PROGRAM I AND PROGRAM IIA FLIGHTS, WITH CAPABILITY OF ADEQUATE PERFORMANCE FOR PROGRAM II AND PROGRAM III FLIGHTS. THE CONTRACTOR SH MONITOR THE DEVELOPMENT OF AN "ALL-INERTIAL GUIDANCE SYSTEM" FOR THE WS 117L BY THE MIT INSTRUMENTATION LABORATORY. DESIGN AND DEVELOP A GUIDANCE SYSTEM COMPATIBLE WITH RESTART ENGINE REQUIREMENTS.

PAGE 57 PARA. 2.5.4.1.1.2 - REVISED TO READ AS FOLLOWS CLN DEVELOP A "FLIGHT CONTROL SYSTEM" FOR THE WS 117L VEHICLE FOR ALL FLIGHTS. THIS SHALL PROVIDE FOR ATTITUDE CONTROL OF THE WS 117L VEHICLE FROM TERMINATION OF BOOSTER THRUST THROUGH REORIENTATION /INITIAL ATTITUDE ORIENTATION IN ORBIT/. DEVELOP A FLIGHT CONTROL SYSTEM COMPATIBLE WITH RESTART ENGINE ATTITUDE CONTROL REQUIREMENTS.

IN AS MUCH AS THE CONTRACTOR IS PROCEEDING AS INDICATED ABOVE, CONCURRANCE BY THE CONTRACTING OFFICER OF THE ABOVE INTERPRETATION OF CCN NO. 23 IS REQUESTED BY RETURN TWX.
BT

R N MENDOZA FOR F HAGENMAIER MANAGER XA/CONTRACTS
C

LOCKHEED MISSILE AND SPACE DIVISION
520P JC..
END

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-59
Amendment No. 6

May 18, 1959 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

ARPA Order No. 17-59, dated September 4, 1958, as amended, is hereby further amended to add the following:

Task 7: Procure four Thor boosters for space vehicle use on ARPA programs during the first half of calendar year 1961. The project assignment of these vehicles will be made later by ARPA.

ARPA Order no 18

The fund availability under Order No. 17-59 is hereby increased from $18.3 million to a new total of $18.4 million under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Department of Defense." Additional funds for Task 7 will be made available as required.

You are requested to supply a schedule of fund requirements and the optimum time for assignment of the vehicles to project use.

Roy Johnson

Roy W. Johnson
Director

Copy to: Secretary of the Air Force
Administrator, NASA

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AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

Task 3 - Agena

In reply address both communication and envelope to:
WDZ

18 May 1959

MEMORANDUM FOR DIRECTOR, SATELLITE SYSTEMS (WDZW)
DIRECTOR, SPACE PROBES (WDZP)
DIRECTOR, COMM/SATELLITE (WDZS)
DIRECTOR, RESOURCE CONTROL (WDZO)
ASSISTANT FOR PROGRAMMING (WDP)
DIRECTOR, SPECIAL PROJECTS, BMC
(MAJOR ROWLAND)

SUBJECT: ARPA Order 17-59 (as amended)

The Commander has directed the implementation of this order in the following manner:

I. GENERAL --- The complexity and time schedules of this Order demand the utmost cooperation and all-out effort on the part of all concerned. In carrying out the tasks required it is expected that a maximum exchange of information will flow among all program offices and contractors. Although two stages are to be developed and two "programs" (Transit and Courier) are mentioned in the ARPA Order, the responsibilities outlined below are assigned in the interests of defining tasks as clearly as possible.

II. RESPONSIBILITIES ---

(1) The Director, Space Probes (WDZP) is responsible for the execution of Tasks 1, 2, 4 and 5 of the ARPA Order. Task 1 is to be continued with NASA in the same manner as with ARPA. The development of the -104 stage will be conducted by a contractor to be selected as most capable to meet the criteria and time schedules in the most efficient and expeditious manner by competition, continuation of present contracts, or sole source contracting action. In carrying out Tasks 2, 4 and 5, the Space Technology Laboratories will be continued in the same role as they are now performing in the Transit Program. An extension to the present STL contract appears as the logical and expeditious approach.

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DOD DIR 5200.10

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(2) The Director, Satellite Systems (WDZW) is responsible for the execution of Tasks 3 and 6 of the ARPA Order. The development of the stage mentioned in Task 3 will be conducted by a contractor selected as most capable to meet the criteria and time schedules in the most expeditious manner by competition, extension of current contracts or sole source contracting action. In carrying out these tasks the Space Technology Laboratories will fulfill their classic weapon system role to be up-dated and specifically modified and delineated for the space system tasks in the contract work statement. Inasmuch as this action introduces STL into an area where they have not previously had responsibilities, the program directors, contractors and all others concerned are enjoined to conduct their activities with the maximum of understanding and mature judgment in the best interests of the United States.

(3) Development Plans for the above will be prepared immediately. The Director of Resource Control (WDZO) will, in conjunction with WDP, assure any necessary integration of these plans and their contents with regard to the overall ARPA Order.

(4) It is requested that BMC through Major Rowland provide the required contracting, procurement, etc., services for these actions. It is further requested that as in (3), above, the contractual actions of Colonel Seay and Major Rowland be coordinated and integrated to the extent required.

(5) The Director, Communications Satellite; the Director, Space Probes; and the Director, Satellite Systems will immediately establish the necessary technical and administrative criteria required to assure that the stages to be developed will meet future needs.

R. D. Curtin

RICHARD D. CURTIN
Colonel, USAF
Deputy Commander
Military Space Systems

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32

AI ORCE BALLISTIC MISSILE DIVISI
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDTIM/Lt Ching/1071

JUN 4 1959

SUBJECT: Letter Contract Supplemental Agreement 35 to Contract AF 04(645)-65, Closed Loop Propellant Utilization System

TO: LBER
Attn: Mr. Edmunds

Refer to DAC letter A-241-260-2092, dated 20 May 1959. WDTI requests that the following changes be made:

a. Paragraph 1, Part I, Sub-paragraph (1):....."in addition, conduct a captive test program." This should be clarified: in addition, conduct a captive test program of this PU system utilizing the existing Block I engine and facilities.

b. Paragraph 1, Part I, Sub-paragraph (4) should be rewritten: Missile Serial 231 shall be utilized by the contractor at Santa Monica to develop a closed loop propellant utilization kit. (The use of this missile has been agreed to in telephone conversation between Major Randall, WDTIM, and Mr. Thomas at DAC.)

c. Paragraph 2. Paragraph 5 of TD-58-2824 should read: Douglas Aircraft shall install and flight test the General Electric Re-entry Vehicle Fairing on a total of three (3) Thor R&D allocated missiles, utilizing Missile Serial Nos. 259, 267, and 275.

M. C. Randall
for RICHARD K. JACOBSON Major
Colonel, USAF
Director, WS-315A

CCN

CLASSIFICATION CHANGED TO UNCLASSIFIED BY
AUTHORITY OF MASTER SECURITY CLASSIFICATION
GUIDE WS315A DTD 7-15-61 BY DATE 5-29-62

56 MCP 19121

~~CONFIDENTIAL~~

~~59 LBM 14757~~

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Task 3 Agena

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

REPLY TO
ATTN OF: WDPCR

8 June 1959

SUBJECT: TRANSIT II Program Progress Report for May 1959

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during the month of May 1959, is the first report submitted under ARPA Order 17-59. Responsibility for the execution of Tasks #3 and #6 of Amendment 4, dated 10 April 1959, to ARPA Order 17-59 has been assigned to the Director of Satellite Systems, Deputy Commander Space Systems, AFBMD. This assignment was made primarily because of the inter-relationship between these two tasks. Task #3, estimated cost $5,150,000, provides for the modification of the Lockheed AGENA vehicle to permit a variety of uses. Task #6, estimated cost, $7,660,000, provides for the delivery of two modified Lockheed AGENA vehicles, two THOR boosters, and the use of this combination to launch TRANSIT II payloads into a 400 nautical mile circular orbit.

2. TECHNICAL STATUS

Work is in progress to accomplish the necessary contractual action to initiate the TRANSIT II Program and to assemble the information required for a Development Plan.

3. PROBLEMS ENCOUNTERED

No significant problems have been encountered during this reporting period.

4. WORK SCHEDULES

Verbal approval has been received from ARPA to integrate the TRANSIT II launchings into the DISCOVERER launch schedule on an

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DOD DIR 5200.10

JUN 11 1959

optimum basis. As soon as this possibility has been fully investigated, a launch schedule will be submitted for approval. ARPA Order 17-59 calls for one TRANSIT II launching in March, and one in June 1960.

RDCurtin for

O. J. RITLAND
Brig. Gen., USAF
Commander

Copies to:
See attached Distribution

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Paragraph 4, Weekly Diary - 11 thru 18 June 1959 from BMC (LBJ)

18 June 1959.

4. DISCOVERER/AGENA: (UNCL)

The following message was received from ARPA by the BMD project office and was submitted to this Directorate for our information and dissemination:

> The upper stage or orbital vehicle stage in the current Discoverer program has been referred to as the Discoverer Vehicle or the Bell Hustler, neither of which is appropriate. Discoverer is a long range program which may utilize a variety of boosters and upper stages. Henceforth the Lockheed developed orbital stages built around the Bell engine will be designated AGENA, repeat, AGENA. Agena comprises the basic vehicle configuration and the Bell engine in its single or dual brim- Burn versions.

BMD: Air Force Ballistic Missile Division
BMC: Ballistic Missile Center; LBJ: Director, Satellite Systems

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 17-60
Amendment No. 8
Project Code No.:
as indicated below

July 1, 1959 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

ARPA Order No. 17, dated September 4, 1958, as amended, is hereby further amended by transferring work on Tasks 2 through 7 to other ARPA Orders and to establish Project Code Numbers as follows:

Task No. 1, pertaining to the TIROS Project, shall remain in ARPA Order No. 17 and shall carry the Project Code No. 1900. Tiros

Former Task 2 shall henceforth be included in ARPA Order No. 95 and shall be identified with Project Code No. 3600. Able-Star

Former Task 3 shall henceforth be included in ARPA Order No. 96 and shall carry the Project Code No. 3600. Agena B

Former Tasks 4 and 6 shall henceforth be included in ARPA Order No. 97 and shall carry Project Code No. 2300. Transit

Former Task 5 shall henceforth be included in ARPA Order No. 98 and shall carry Project Code No. 2200. Courier (polar Star)

Former Task 7 shall henceforth be included in ARPA Order No. 48 and shall be identified with Project Code No. 3100. 4 Thor Sup. NASA

ARPA Order No. 17-60
Amendment No. 8

The fund availability on ARPA Order No. 17-59, as amended, is not changed, the funds therein pertaining to the FY 1959 program.

FY 1960 funds as required will be placed on the new Orders.

L. P. Gise
Acting Director

Copy to: Secretary of the Air Force
NASA

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 96-60
Project Code No. 3600

July 1, 1959 Date

See amendment #1-15 Oct 59
" " #2-3 Dec 59

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

1. Pursuant to the provisions of DoD Directive 5105.15, dated March 17, 1959, you are requested to proceed at once on behalf of the Advanced Research Projects Agency with the project specified below. Additional details and directives may be issued by ARPA from time to time and will become a part of the Order when so specified.

2. Continue work formerly authorized under Task 3 in Amendment No. 4 to ARPA Order No. 17:

> Modify the Agena stage to obtain dual burning capability, simplify guidance and control system, structural simplification such that payloads of arbitrary shapes may be carried and increased propellant carrying capacity. Estimated cost - $5,150,000.

3. This Order makes available $4,250,000 under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Department of Defense." The difference between the estimated cost and the funds herein was made available in FY 1959 in ARPA Order No. 17-59.

4. The Director, ARPA, and the Office of the Secretary of Defense will be kept informed by monthly progress reports to be prepared and submitted in accordance with the procedures outlined in Attachment No. 1.

5. The utilization of equipment and materials procured in connection with this project is subject to the direction of ARPA. Notwithstanding, final disposition of such equipment and materials shall be made in accordance with standard procedures.

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

~~DECLASSIFIED DOD DIR 5200.10~~

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

ARPA Order No. 96-60
Project Code No. 3600

6. The Air Research and Development Command shall be responsible for preserving the security of this project in accordance with the security classification assigned and the security regulations and procedures of the Department of the Air Force.

7. Notwithstanding any other provisions of this Order, the Air Research and Development Command shall not be bound to take any action in connection with the performance of this work that would cause the amount for which the Government will be obligated hereunder to exceed the funds made available, and the obligation of the Air Research and Development Command to proceed with the performance of this work shall be limited accordingly. The Air Research and Development Command shall be responsible for assuring that all commitments, obligations and expenditures of the funds made available are made in accordance with the statutes and regulations governing such matters provided that, whenever such regulations require approval from higher authority, such approval will be obtained from or through the Director, ARPA, or his designated representative.

L. P. Gise

L. P. Gise
Acting Director

1 Incl.:
Attachment No. 1

Copy to: Secretary of the Air Force

~~CO[illegible]AL~~

Attachment No. 1 ARPA Order No. 96-60

PREPARATION OF MONTHLY PROGRESS REPORTS

This report will be submitted in two parts, a narrative section and a milestone progress section.

I. Narrative Section

A letter report will be submitted each month by the addressee of the above numbered ARPA Order, giving a narrative account of work performed. The initial report will cover the month of July, 1959. Subsequent reports will cover work performed during each month thereafter. Each report will be submitted in quadruplicate to the Director, Advanced Research Projects Agency, and is due within 10 days following the close of the month reported. The heading of each report should contain the following information:

- Order Number
- Project Code Number
- Name of Contractor
- Date of Contract
- Amount of Contract
- Contract Number
- Contract Termination Date
- Project Scientist or Engineer
  - Name and Phone Number
- Short Title of Work

The report will be in letter form and generally not exceed three pages in length. It will present a narrative summary of work performed including specific reference to the following topics: technical status, major accomplishments, problems encountered, future plans, and any action required by ARPA. The initial report should include an introductory preface outlining the background, objectives, and assignment of responsibility for the project. All reports should include photographs and illustrations as appropriate. Prior to establishment of a contract, the addressee will prepare the report indicating status of contract negotiations, problems encountered, if any, and an estimated contract completion date.

II. Milestone Progress Section

Instructions for preparation of this section will be issued following establishment of appropriate milestone schedules.

63

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AO 39

Task 3 Agena 1

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

REPLY TO
ATTN OF: WDPCR

8 July 1959

SUBJECT: TRANSIT II Program Progress Report for 30 June 1959

Task #6
changed to
Thor-104 (Able Star)
by Amend 1 to AO 97

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during the month of June 1959, is the second submitted under ARPA Order 17-59, Tasks #3 and #6 of Amendment 4, dated 10 April 1959. Program responsibility has been assigned to the Director of Satellite Systems, Deputy Commander Space Systems, AFBMD, primarily because of the interrelationship between these two tasks. Task #3, estimated cost $5,150,000 provides for modification of AGENA vehicle to obtain dual burning capability and simplified guidance and control system. Task #6, estimated cost, $7,660,000, provides for the delivery of two modified Lockheed AGENA vehicles, two THOR boosters, and the use of this combination to launch TRANSIT II payloads into a 400 nautical mile circular orbit.

2. TECHNICAL STATUS

a. At a Lockheed Missile and Space Division (LMSD) briefing held on 2 June, it was agreed that the optimum tank size for use in the AGENA vehicle should be twice the development size. ?

b. On 4 June a Coordination Meeting was held, with representatives from ARPA, AFBMD, LMSD and Applied Physics Laboratory. LMSD gave the status of the tank study and restart engine development. Applied Physics Laboratory described the TRANSIT II payload and furnished the requirements for the AGENA stage as determined by the payload. The interface between the payload and the AGENA second stage is rather simple and appears to present no problems. The attaching device and release mechanism will be identical and interchangeable with that used on TRANSIT I.

3. PROBLEMS ENCOUNTERED

No significant problems have been encountered during this reporting period.

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DOD DIR 5200.10

JUL 13 1959

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4. WORK SCHEDULES

Investigation of the verbally approved integration of TRANSIT II launchings into the DISCOVERER schedule is being continued. As soon as this possibility has been investigated fully, a launch schedule will be submitted for approval. TRANSIT II launches are scheduled for March and June, 1960.

5. ARPA ACTION REQUIRED

No action is required at this time.

H. L. Evans
for O. J. RITLAND
Brig. Gen., USAF
Commander

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RECEIVED
A F B M D
ACTION WDZE

28 JUL 1959 22 54

INFO WDZ

A-5 FROM LOCKHEED MSD SUNNYVALE CALIF TWX 91 JUL 28 249P
COMMANDER AIR FORCE BALLISTIC MISSILE DIVISION
HQ AIR RESEARCH & DEVELOPMENT COMMAND DETACHMENT NO. 2 /FBMD/
LOSANGELES CALIF

BT
UNCLASSIFIED LMSD/436743
SUBJECT CLN IMPROVING MODEL 8048 ENGINE PERFORMANCE
REFERENCE CLN CONFERENCE LT. COL. E. BLUM AND LT. COL. R. WORTHINGTON /AFBMD/, R. C. KENT AND L. R. VIGGIANO /LMSD/, ON 21 JULY 1959.

AS DISCUSSED IN REFERENCED CONFERENCE, IT IS DESIRED THAT AFBMD GIVE LMSD AUTHORIZATION TO PROCEED ON AN EXPEDITED PROGRAM TO IMPROVE THE MODEL 8048 ENGINE PERFORMANCE BY INCREASING SPECIFIC IMPULSE BY APPROXIMATELY THIRTEEN SECONDS. BELL AIRCRAFT CORP. HAS INDICATED THAT A 35 TO 1 NOZZLE AND TRIPLET INJECTOR COULD BE PROVIDED WITHIN EIGHT WEEKS AFTER GO-AHEAD AT AN ROM COST OF $300,000.00. LMSD RECOMMENDS THIS PROGRAM BE INITIATED IMMEDIATELY.
BT
C. E. HAGENMAIER MANAGER SATELLITE SYSTEMS CONTRACTS
Z[illegible]AMGZZZ8/N/// LOCKHEED MISSILES AND SPACE DIVISION.
351P. JC..
END
RECD 1 MSG

COORDINATION SHEET

R+D 1-39

OFFICE OF ORIGIN WILL ENTER OFFICE SYMBOLS IN THE "TO" BLOCKS IN ORDER OF DESIRED COORDINATION

PERSON COORDINATING WILL ENTER NAME AND DATE IN APPROPRIATE BLOCK

WDZE/Lt Col Blum/2741

TO: Performance Improvement of LR81-Ba-5 Engine

WDJ, Mr. Silberman

JUL 31 1959

1. Reference attached TWX LMSD/436743 dtd 28 Jul 59.

2. It is requested that LMSD be authorized to proceed on an expedited development program to improve the performance of the LR81-Ba-5 engine by increasing the nozzle area ratio to 35 to 1 and incorporating a triplet injector for the current Discoverer vehicles.

2. This program is expected to take eight weeks. The cost is estimated to be approximately $300,000.

1 Atch
LMSD/436743 TWX, 1 cy, UNCLAS

SIGNED

FREDERIC C. E. ODER
Colonel, USAF
Director, Satellite Systems

Copies to: WDZS
WDZF
WDZSD

TO: WDZF
NAME: N. Welch
DATE: 29 July

Understood that this requirement will be included within the LMSD negotiated contract when finalized

OFFICE OF ORIGIN: WDZE
TYPIST: lkg-29 Jul 59
PHONE NO:
DATE: 31 Jul 59

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AFBMD Form 11

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40

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

REPLY TO
ATTN OF: WDPCR

7 August 1959

SUBJECT: Modification of AGENA Vehicle

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during the month of July 1959, is the first to be submitted under ARPA Order No. 96, dated 1 July 1959, (Project Code No. 3600). The work was formerly directed by Task 3 of Amendment No. 4 to ARPA Order No. 17. Order No. 96 calls for the modification of the AGENA stage to obtain dual burning capability and structural simplification to permit installation of payloads of various shapes, and to permit increased propellant carrying capacity. Funding is provided by ARPA Orders No. 17 ($900,000) and 96 ($4,250,000).

2. TECHNICAL STATUS

No report-worthy items occured during this period.

3. PROBLEMS ENCOUNTERED

No problems were encountered during this period.

4. WORK SCHEDULES

All work is currently on schedule.

5. ARPA ACTION REQUIRED

No ARPA action is required at this time.

for Frederick E Oder Col USAF
O. J. RITLAND
Maj. Gen., USAF
Commander

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AUG 8 05 07 '59

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FM COMDR AFBMD ARDC LOSA
TO AFSWC KIRTLAND AFB
BT
/U N C L A S/FROM WDZE 8-6-E. FOR SWODO MAJ MARTIN. REQUEST COST PROPOSAL FOR CENTRIFUGE TESTING OF ONE PROPELLANT TANK BE SUBMITTED TO AFBMD ATTN WDZE CAPT FIEBELKORN. THIS TESTING SHALL BE IN CONFORMANCE WITH LMSD 435943 ALREADY MAILED TO YOU. LMSD ESTIMATES APPROX 1400 MANHOURS OF EFFORT WILL BE FURNISHED BY LMSD CONSISTINGOF SEVEN TECHNICIANS AND ONE ENGINEER FOR EACH SHIEFT AND TWO SHIFTS PER DAY WILL BE REQUIRED. SET UP AND TAKE DOWN TIME ARE EACH ESTIMATED AT TWO DAYS TWO SHIFTS PER DAY. LMSD AGREES TO ARRIVE NOT EARLIER THAN 14 NOV AND LEAVE NOT LATER THAN 22 NOV BUT REQUESTS PERMISSION FOR ENGINEER PERSONNEL TO ARRIVE ONE TO TWO DAYS EARLIER TO ASSIST IN PREPARATION FOR TEST. OVERTIME FOR SANDIA PERSONNEL WILL BE ALLOWED.
BT
07/2350Z AUG RJWZBK

07

NNNN

42

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION • SUNNYVALE, CALIFORNIA

In reply refer to:
LMSD/437463-62/23

10 August 1959

Subject: Contract No. AF 04(647)-347
Flight Termination System Atlas Boosted Vehicles

To: Commander
Air Force Ballistic Missile Division
Hq., Air Research and Development Command
Attn: Major George Austin
Air Force Unit Post Office
Los Angeles, 45, California

1. The present flight termination signal from the Atlas booster to the Lockheed satellite vehicle is restricted to 0.1 amperes at 22 volts for .0025 seconds. LMSD initially agreed with these design parameters, however, development of the satellite vehicle flight termination system has not resulted in a design considered sufficiently reliable for operation under the anticipated flight environment. Circuit designs considered for reliable operation at the extreme low energy level are subject to malfunction by random noise signals or flight vibration energy.

2. It is requested that the destruct signal energy level from the booster vehicle be increased to a minimum of 2.5 amperes for .0025 seconds at not less than 6.0 volts for each of the two flight termination signal channels. This will permit the direct fire of a satellite vehicle destruct charge without the interposition of a low energy level switch component.

3. The flight termination system of the satellite vehicle is being redesigned on the basis of this higher energy level signal.

LOCKHEED AIRCRAFT CORPORATION
MISSILES AND SPACE DIVISION

for R. Smelt, Manager
Satellite Systems

RS/CWB:mle

cc: Air Force Plant Representative
Sunnyvale, California

Atlas - Agena

atlas

R+D 1-43

COORDINATION SHEET

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WDZEV/Capt Fiebelkorn/2594 AUG 13 1959

(U) Minutes of MIDAS FTWG Flight Operations Subcommittee, 29 Jun 59

WDZSM (Maj Callan)

1. Reference your letter dtd 3 Aug 59, subject as above. The procedures identified in the attached FTWG Subcommittee Minutes are accurate although some explanation is necessary.

2. Paragraph 5 is a reasonable procedure in that after the umbilical is ejected only internal power and telemetry would be used to verify signals. More complete checks can be made by leaving the umbilical attached.

3. Paragraph 6 requires more explanation to be clear. First, if the Agena destruct system is armed, the G. E. guidance disarm does not return it to safe. While the Agena and Atlas are mated, however, the only signal that can activate the Agena destruct must come from the Atlas, so the G. E. disarm should prevent accidental destruct. Second, some explanation of umbilical procedure may help the problem. The Agena stage has two electrical umbilicals, one of which is ejected and the other pulls away at lift-off. The pull away umbilical is the only one containing destruct "arm" or "safe" circuits. Ejection of the main umbilical will have no effect on the ability to arm or disarm the Agena destruct. This ability is only lost at lift-off. Should both umbilicals be pulled inadvertently through presently inconceivable means the conditions described in the Minutes are correct.

4. Remote operation of the Agena electrical simulator had not been previously planned. Addition of this as a requirement would necessitate modification of the equipment and installation of facility cabling and additional Blockhouse equipment. Full electrical system checkout during a countdown with an unfueled Atlas could be performed as far as the Atlas is concerned, the presence of electrical signals from the Agena during the FRF has little effect and demonstration of booster capability is not impaired.

ROY H. WORTHINGTON, JR.
Lt. Colonel, USAF

RHW

EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro-Engrg

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atlas Agena

Atlas E&D 1-1

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COORDINATION SHEET

WDZEV/Capt Fiebelkorn/2594

Flight Termination System of Atlas Boosters

AUG 18 1959

WDTCS (Lt Col Salzer)

1. The previously agreed-upon design parameters for the Agena vehicle destruct system when used with the Atlas boosters do not permit a sufficiently reliable design under the anticipated flight environment.

2. To alleviate this problem, we request that the Atlas booster supply a destruct signal energy to the Agena vehicle of a minimum of 2.5 amperes for .0025 seconds at not less than 6.0 volts for each of two destruct channels. This will allow direct firing of the Agena vehicle destruct without the interposition of a switching element in the Agena.

13

GEORGE E. AUSTIN
Major, USAF
for
EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro-Engrg

ORIGINATOR/COORDINATION Capt Fiebelkorn					
DATE 17 August 1959					

~~CONFIDENTIAL~~

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO
ATTN OF: WDPCR

8 September 1959

SUBJECT: Modification of AGENA Vehicle, 31 August 1959

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during the month of August 1959, is the second to be submitted under ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). The work was formerly directed by Task 3 of Amendment No. 4 to ARPA Order No. 17. Order No. 96 calls for the modification of the AGENA upper stage vehicle to obtain single restart capability and to provide increased propellant carrying capacity.

2. TECHNICAL STATUS

a. Program History and Major Features - In April 1959 ARPA directed AFBMD to initiate this development program as outlined in Task 3 of Amendment 4 to ARPA Order No. 17 (superseded by Order No. 96). AFBMD/BMC contracted with Lockheed Missile and Space Division to implement such a development program as a CCN to Contract AF 04(647)-97. Since LMSD previously had been directed to instruct Bell Aircraft Corp to plan and conduct an analysis to determine the feasibility of adding single restart capability to the XLR-81-BA-5 AGENA engine, and a feasibility of restart testing program was in progress at Arnold Engineering Development Center, the LMSD implementation to this program was greatly expedited. The major features of the program include a 100 percent increase in propellant tankage and addition of a restart capability, generally using components already proved in the existing AGENA engine with several improved components (valves) where increased reliability was needed as a result of the restart requirement.

b. Program Objectives - include analysis and feasibility testing for reliable restart capability, mockup, development testing, preliminary flight rating tests (PFRT) and flight engines.

c. Single Restart Development Milestones and Status - Program authorization was obtained in April 1959. Engine mockup review and approval was completed in June 1959. PFRT and altitude chamber testing to determine chamber performance accurately by calculation of the

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actual thrust coefficient (C_f) and to evaluate thrust chamber starting, restarting and shutdown transient, coasting periods and steady state operation, is scheduled to begin in October 1959. The first flight engine is scheduled for delivery to LMSD in October 1959 for use in an April 1960 flight. No delay in meeting these schedules is evident. The highlights of the restart capability development to date include four 240 second duration thrust chamber runs and two 240 second duration prototype engine runs on 29 and 20 August, respectively, with no difficulties experienced. One recent fuel valve malfunction and one misfire on engine start have been reported, but analysis of these two incidents has not yet indicated the existence of a major problem.

d. Increased Propellant Capacity Development Status - The tank size selected for development has twice the volume of present AGENA tanks. This degree of increase was determined to be near optimum for both THOR and ATLAS booster programs as a result of optimization studies. The internal configuration of the increased tankage is being designed with emphasis on the portion that is dissimilar from present tank design. This involves slosh control in the cylindrical section that was used to double the tank volume. This section is being designed as an integral part of the vehicle structure and as such is the only major change in the vehicle structure configuration. The design increases the present AGENA structure only by six feet in length. Engineering for this change has been released and a test program, involving different baffle configurations as determined by data from other programs, is in process. It appears that no major problems will be encountered and that a twice capacity AGENA vehicle will be available for the scheduled April 1960 flight.

3. PROBLEMS ENCOUNTERED

No significant problems have been encountered during this reporting period.

4. WORK SCHEDULES

All work is essentially on schedule as indicated in paragraph 2.

5. ARPA ACTION REQUIRED

No ARPA action is required at this time.

RDCurtin
for

O. J. RITLAND
Maj. Gen., USAF
Commander

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WDZEA/MajAustin/2741

Discoverer Capsule Batteries

SEP 10 1959

WDZSD

1. It has been contended that low capsule battery temperature may have been responsible for failure of Discoverer recovery sequence operations, and the proposed fix has been simply the addition of heaters to the battery pack. However, the ability of this battery to furnish an adequate current pulse with required reliability, even at room temperature, is seriously in doubt.

2. The battery concerned is the 6.5 volt beacon filament battery which must furnish a constant current (stated to be 150 milliamperes) to the filament and, two superimposed pulses for activation of thermal batteries and firing of pyrotechnic switches. The more critical of these pulses is specified to be 2.6 amperes minimum all-fire. Simulated General Electric tests at 45° F show a current capacity of only 2.1 amperes. Test results at room temperature are nebulous and not reassuring, "between 3 and 4 amperes" having been reported.

3. A considerably more comfortable margin of safety must be achieved in the current pulse capacity of the beacon filament battery, or a modified power supply design must be used. Mere addition of heaters will not provide the reliability desired. Prior to acceptance of the capsule for flight, test data must be furnished establishing beyond doubt that adequate safety margins have been achieved.

GEORGE E. AUSTIN
Major, USAF

EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro-Engineering

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WDZE-54

ORIGINATOR COORDINATION					
DATE					

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R+D 1-4-1

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PERSON COORDINATING WILL ENTER NAME AND DATE IN APPROPRIATE BLOCK

WDZEG/MajSchmitt/2741

STL Plan 165-41, Study of Attitude Sensors for Space Missions, 1 Aug 1959

SEP 17 1959

WDZRT (Capt Van Dusen)

1. The subject plan has been reviewed by this Directorate.

2. A horizon sensor has been developed and successfully tested by the Advanced Technology Laboratories under subcontract to LMSD for the Agena vehicle. Further, LMSD has recently requested bids from a number of companies for the development of a more accurate and reliable sensor. About seven proposals were received. The preparation of these proposals and their evaluation by LMSD, along with the development of the item by the successful bidder, includes a complete evaluation and exploration of horizon scanner components, devices, and associated electronics which is suggested by STL.

3. Under the Samos program, the requirement exists that attitude information be transmitted to the payload package. For both the Samos and MIDAS programs appropriate attitude information must be transmitted to both the autopilot and the orbital attitude control system. Both digital and analog techniques are under investigation by LMSD to meet these requirements.

4. In view of the effort described in paragraphs 2 and 3, it is recommended the proposals for investigating horizon sensors and signal processing techniques be rejected.

5. Although some investigations have been made concerning your attitude sensors and very accurate attitude rate sensors, there is at this time a definite lack of information in these areas. It is suggested that a conference be arranged with STL in order that this Directorate may become more familiar with this segment of STL's plans.

SIGNED

EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro-Engineering

Atch
~~STL Plan 165-41~~

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48

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED S[illegible]
Air Force Unit Post O[illegible] California

REPLY TO ATTN OF: WDZSM/Major Callan/2596

SUBJECT: Recommendations of LMSD-CVAC Vehicle-Booster Configuration Meeting

SEP 26 1959

TO: WDZE

1. As a result of the vehicle-booster configuration meeting with LMSD-CVAC on 25 September 1959, the following recommendations are made:

a. The LMSD recommendation to utilize a modified Atlas-D missile as a standard booster for the AGENA vehicle be accepted.

b. A thorough investigation be made by LMSD of the possibility of utilizing the double tank AGENA with the Bell 8096 engine for the third MIDAS flight (First MIDAS, Point Arguello launch) and changing the present 1012 vehicle now in Manufacturing to SAMOS configuration for use in that program.

c. A thorough study be made by LMSD of incorporating interchangeability between pads A and B of Complex 1, Point Arguello for SAMOS, MIDAS, and COMSAT in order to provide the flexibility which would result therefrom.

Quenten A. Riepe
QUENTEN A. RIEPE
Lt. Colonel, USAF
Director
MIDAS Satellite System

Copies to:
WDZT
LBZJ

Are [illegible] further meetings, these objectives and being planned.

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WDZSM 49

WDZEE

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Sep 29, 1959

WDZS/Col Oder/1822

DISCOVERER/SAMOS/MIDAS/COMSAT/AGENA Configurations

---

1. At an early stage in the subject programs it is essential in terms of cost of vehicles, GSE change costs, operations costs and reduction in confusion that we go to a minimum number of AGENA configurations in terms of the common subsystems involved. The goal is for one standard AGENA (aft of a jointly agreed to vehicle station) and for a minimum number of program-peculiar components.

2. This goal must be reached not later than the final quarter of CY 1960.

3. In order to make maximum use of the limited available launch facilities the goal of standardization must extend to GSE and launch control and checkout equipment.

4. It is desired that WDZE assume responsibility for preparation of a specific plan to accomplish the above with the participation of system directorates, other addressees as necessary, and contractors. A first report on this program should be available for presentation at the next Commanders Internal Management Conference.

5. LBZT will be consulted and will participate in working out LMSD participation.

6. WDZSC will arrange for inclusion of overall STL system requirements in the program, WDZE will assure that STL inputs for peculiar COMSAT vehicle requirements are included in this plan, WDZT and WDZQ will arrange for STL COMSAT contributions pertinent to _____ of their responsibility as pertains to AGENA.

7. As an integral part of this action consideration will be given to prompt establishment of a configuration control board for the AGENA. There may be some conflicts with existing AFBMDR's on this subject since the AGENA is but a portion of several systems. Request WDZSK, together with WDZE and LBZI, with assistance from other WDZ elements as needed, develop a course of action for such a board, including waiver actions to existing AFBMDIR's.

/S/
FREDERIC C. E. ODER
Colonel, USAF
Assistant Deputy Commander
Space Systems

Cys to:
WDZ
WDZD

~~CONFIDENTIAL~~

49

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDPCR

1 October 1959

SUBJECT: Modification of AGENA Vehicle, 30 September 1959

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during the month of September 1959, is the third to be submitted under ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). The work was formerly directed by Task 3 of Amendment No. 4 to ARPA Order No. 17. Order No. 96 calls for the modification of the AGENA upper stage vehicle to obtain single restart capability and to provide increased propellant carrying capacity.

2. TECHNICAL STATUS

a. The major features of this modification program include a 100 percent increase in propellant capacity, the capability to burn for 240 seconds continuously, and a restart capability. This modified version of the present XLR-81-Ba-5 engine is designated as the XLR-81-Ba-7 (Bell Aircraft Model 8081).

b. A technical direction meeting with LMSD and BAC personnel was held at AFBMD on 22-23 September. The development status of the XLR-81-Ba-7 engine was investigated completely. Results of this meeting indicate that the program is essentially on schedule and will continue so to a successful conclusion.

c. Thrust chamber burn out occurred on two occasions when the solid content of the inhibited red fuming nitric acid exceeded 0.05%. This is believed to be due to the deposit of small quantities of the solid on the wall of the coolant passage, resulting in restricted heat transfer to the cooling media in localized areas. This matter is under investigation.

d. Engineering design for the double capacity propellant tanks was released for fabrication at the end of August. The baffle design was based on the best experiences of LMSD, DAC and Convair. Slosh testing began on 28 September and is scheduled for completion

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within 3 weeks. No troubles are anticipated. 6061 aluminum will be used because of its proven capability in the fabrication of the smaller tanks.

3. PROBLEMS ENCOUNTERED

No significant problems have been encountered during this reporting period.

4. WORK SCHEDULES

a. All engine vibration tests, development tests of the turbine assembly, and thrust chamber tests are complete. The first engine will be delivered to LMSD on 7 October.

b. The first double capacity tank is scheduled for completion on 13 October and will be sent to SANDIA Base (Albuquerque, NM) for centrifuge testing during 15-22 November.

c. The second tank is due to be completed 2½ weeks after the first tank and will go into a flight vehicle.

d. The third tank will be sued for qualification testing (pressure, vibration, etc.). Qualification tests are expected to be completed by 1 January.

e. Tank four or five will be used for engine testing at Santa Cruz Test Base. At present a steel tank of the same configuration is being prepared for engine testing at SCTB.

5. ARPA ACTION REQUIRED

No ARPA action is required at this time.

Harry L. Evans
for O. J. RITLAND
Maj. Gen., USAF
Commander

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R+D 1-2-50

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AFBMD, ARDC, LOS ANGELES, CALIFORNIA

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LOCKHEED MISSILES AND SPACE DIVISION
SUNNYVALE, CALIFORNIA

~~CONFIDENTIAL~~ FROM WDZE 10-5-E FOR MR. F. O'GREENE AND MR. LOU VIGGIANO

THIS IS TO CONFIRM VERBAL AGREEMENT BETWEEN LT COL BLUM AND MR. O'GREENE THAT LMSD WILL PRESENT THE ORBIT ADJUST PROPULSION SYSTEM STUDY TO WDZE NO LATER THAN 16 OCT 1959. ACTION IS CURRENTLY BEING TAKEN THRU AFBMC TO PROVIDE LMSD WITH AN OFFICIAL GO-AHEAD TO PROVIDE AN AUXILLIARY PROPULSION SUBSYSTEM FOR ORBIT ADJUST AS REQUIRED FOR THE MIDAS AND SAMOS SYSTEMS. IN VIEW OF THIS LMSD SHOULD START IMMEDIATE ACTION WITH A MINIMUM OF THREE PROPULSION DEVELOPMENT INDUSTRIES TO OBTAIN COMPREHENSIVE PROPOSALS FOR DEVELOPMENT OF THIS ADDITIONAL SUBSYSTEM. AFBMD-WDZE WILL ATTEND BIDDERS CONFERENCE HELD TO SUPPLY PROSPECTIVE SUB-CONTRACTORS WITH DETAILED INFORMATION CONCERNING ALL ASPECTS OF THIS DEVELOPMENT. REQUESST EARLY NOTIFICATION COVERING TIME AND

5 OCT 1959

WDZEP

SIGNED

LT COL [illegible]
2741

1 2

[illegible] F. [illegible]
Lt Colonel, USAF
Director, [illegible]

ORIGINATOR COORDINATION					
DATE					WDZE-[illegible]

FORM

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ROUTINE
ROUTINE XX AF

COMDR AFBMD HQ ARDC LOS ANGELES, CALIFORNIA

ARNOLD ENGINEERING DEVELOPMENT CENTER
TULLAHOMA, TENN.

INFO:

LOCKHEED MISSILES AND SPACE DIVISION
SUNNYVALE, CALIFORNIA

BELL AIRCRAFT CORP
NIAGRA FALLS, NEW YORK

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~~CONFIDENTIAL~~ FROM WDZE-10-10-E. FOR E. HIVELY, AEOE; W. GARDENIER, ARO, INC.; INFO L. VIGGIANO, LMSD; D. FELD, BELL AIRCRAFT CORP. REFERENCE XLR-81-BA-7 (BAC MODEL 8081) AGENA ENGINE ALTITUDE RESTART PROGRAM PRESENTLY SCHEDULED FOR PERIOD 19 OCT THRU 15 NOV 59. OBJECTIVES AND SCOPE OF AGENA PROPULSION SYSTEM ALTITUDE TESTING PROGRAM HAVE CHANGED DUE TO LAUNCH PROGRAM EXPERIENCE TO DATE. BAC WILL FURNISH DETAILS OF PROPOSED TEST PROGRAM CHANGES TO LMSD AND AEDC PRIOR TO START OF AEDC TESTING. IT NOW APPEARS, ~~BUT IS NOT FIRM~~, THAT PRESENTLY PROGRAMMED RESTART TESTS WILL NOT BE CONDUCTED UNTIL LATE IN THE BAC MODEL 8096 (XLR-81-BA-9) ENGINE LEVEL TESTS WHICH WILL BE PROGRAMMED FOR JAN AND FEB 60 AT AEDC.

WDZE-89
ROY H. WORTHINGTON, 9 OCT 59
Lt. Colonel, USAF

WDZE

Lt Colonel Worthington

[illegible]
LtColonel, USAF
Director, Astro-Engineering

ORIGINATOR COORDINATION	1	2			
DATE					

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COMDR AFBMD HQ ARDC LOS ANGELES, CALIFORNIA

THE BAC MODEL 8096 ENGINE INCORPORATES A 45:1 AREA RATIO (APPROX), IMPROVED INJECTOR AND PROPELLANT PUMP. INDUCERS AS WELL AS RESTART AND EXTENDED BURN CAPABILITY.

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COORDINATION SHEET

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ROUTINE

XX AF

COMDR, AFBMD HQ ARDC, LOS ANGELES, CALIF

LOCKHEED MISSILES AND SPACE DIVISION
SUNNYVALE, CALIFORNIA

INFO:
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NIAGRA FALLS, NEW YORK

ARNOLD ENGINEERING DEVELOPMENT CENTER
TULLAHOMA, TENN.

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~~CONFIDENTIAL~~ FROM WDZE-10-9-E. FOR R. SMELT AND L. VIGGIANO; INFO D. FELD, BELL AIRCRAFT CORP; E. HIVELY, AEOE AND H. GARDENIER, ARO, INC., AEDC. REFERENCE LMSD/438658, S/S B TECHNICAL DIRECTION MEETING AT AFBMD- WDZEP ON 22-23 SEPT, AND TELECON BETWEEN LT COLONEL WORTHINGTON AND L. VIGGIANO 5 OCT 59. AEDC ROCKET ENGINE TEST FACILITY WILL BE AVAILABLE THE LATTER PART OF OCT FOR APPROX TWO MONTHS FOR AGENA ENGINE TEST PROGRAM. REQUIREMENT FOR MODEL 8048 ALTITUDE PERFORMANCE EVALUATION AND MODEL 8096 DEVELOPMENT PROGRAM PRESENTLY OVER-SHADOWS IMPORTANCE OF MODEL 8081 RESTART PROGRAM. THE PERIOD PRESENTLY ASSIGNED FOR USE OF AEDC FACILITIES SHOULD BE USED FOR 8048 AND 8096 TESTING ONLY. BAC SHOULD BE IMMEDIATELY DIRECTED TO FURNISH AEDC WITH TEST PROGRAM FOR THIS PERIOD.

9 OCT 59

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ROY H. WORTHINGTON, JR.
Col USAF

WDZE

Lt Col Worthington
2711

EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro Engineering

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COMDR AFBMD HQ ARDC, LOS ANGELES, CALIFORNIA

IN ADDITION BAC SHOULD DEVELOP A TEST PROGRAM FOR AEDC TESTING OF ENGINE LEVEL MODEL 8096 INCLUDING RESTART EVALUATION. THIS PROGRAM IS TENTATIVELY SCHEDULED AT AEDC FOR PERIOD 1 JAN - 1 MARCH 60. BAC SHOULD, HOWEVER, RECOMMEND A MORE FIRM DATE WHEN 8096 ENGINE LEVEL TEST PROGRAM PROPOSAL IS COMPLETED.

WDZE-88

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DATE					

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ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 96-60
Amendment No. 1
Project Code No. 3600

October 15, 1959 Date

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

1. ARPA Order No. 96, dated July 1, 1959, is hereby amended as follows:

a. Prepare and submit a development and funding plan within 15 days. The development plan shall identify significant technical objectives and the time phasing of planned accomplishment. The plan should, by indicating key dates and points of decision (i.e., commence engine PFRT, complete PFRT, release of guidance and control design for production, etc.), furnish a basis for progress measurement which is meaningful to the contractors, ARDC, and ARPA. [illegible] Contract dates should be included. From this plan a milestone schedule will be prepared for subsequent use in reporting of progress.

[illegible] made available by this agency will be utilized for [illegible]

[illegible] The funding plan should support the development plan [illegible]

[illegible] between [illegible] and material, [illegible] overall [illegible]

[illegible]

[illegible]

ARPA Order No. [illegible]
Amendment No. [illegible]
Project Code No. 3600

c. The development and funding plan referred to above shall be kept current by timely revisions as necessary.

The Director, Advanced Research Projects Agency, will provide policy and technical guidance, either directly or through designated representatives. The ARDC will be responsible for arranging for the detailed technical directions necessary to accomplish the specified objectives and to comply with ARPA policy and technical guidance. This general relationship may be specified in greater detail by correspondence from authorized officials of ARPA as may be necessary.

Roy W. Johnson
Director

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COORDINATION SHEET

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WDZEV/Miscellaneous/2504

Space Programs Status Report

15 Oct 1959

WDPCR

Reference your letter of 30 Sep 59 to WDZF, forwarded herewith is portion of information on the space programs for which WDZE is responsible.

91

HENRY TRIWUSH
HT for ~~EDWARD~~ Major, USAF
~~Lt Colonel, USAF~~
Director, Astro-Engineering

Atch
WDZE portion of Status Rpt
(S) WDZE 59, 4 pgs; ~~2 Atlas/Agena~~
~~Charts, 1 Thor/Agena Charts, (S)~~
~~WDZE 59~~

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WDZE-99

ORIGINATOR COORDINATION WDZEV					
DATE 15 Oct 59					

ARDC FORM 44

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I. GENERAL:

1. The Agena presently being designed is used for three different approved programs. Each program will be discussed individually. An explanation of payload is necessary for understanding of the curves. Payload is defined as being all orbit weight not required to achieve the specific orbit intended. This weight will, therefore, include sensors, telemetry and auxiliary power necessary to operate equipment on orbit. If some attitude control of the Agena is required for orbit, it must also come from payload.

2. The missions of the guidance and control system are to:

a. Guide the satellite into an orbit having the desired eccentricity and period. This is accomplished by controlling the Agena attitude after separation from the booster vehicle until termination of orbital injection, and by initiating and terminating Agena thrust for orbital injection.

b. Control the attitude of the Agena on orbit when it is used as the satellite vehicle.

II. DISCOVERER:

1. The Discoverer program uses a vehicle made up of an operational Thor missile with the exception of the guidance system, and the Agena, using a single-tank configuration. This system does not have a restart capability and as such has a performance as shown on Thor-Agena payload capability curve No. 1.

2. In April 1960 a modified Thor will be brought into the program. This booster, known as Thor DM-21, will use the operational Thor engine system and propellant tankage. The guidance section will be shortened and minor changes of equipment will be made to make a more efficient booster. On this booster will be placed an Agena having double propellant capacity and using a restartable engine. This engine will have the same specific impulse as those presently used. Performance for this combination is shown as curve No. 2 on the Thor-Agena payload capability graph.

3. In July 1960 an engine modification for the Thor will be included up-rating the thrust to 165,000 pounds. At the same time the engine in the Agena will be modified increasing specific impulse from 279 seconds to 290 seconds. The performance for this combination is shown as Thor-Agena curve No. 3.

4. The objectives of the guidance and control system call for deviations from the desired orbital eccentricity of less than .01, from the desired mean altitude of less than 40 miles, and from the desired

~~CONFIDENTIAL~~ MD 22-99

attitude on orbit of less than 2°. The eccentricity and attitude objectives are met by use of an optical-inertial (horizon sensor and inertial reference package) guidance system and pneumatic gas jet and hydraulic actuated rocket engine control system. The eccentricity is further controlled by an accelerometer-integrator combination to cut off the orbital injection engine when the proper velocity is gained during orbital boost. The integrator can be corrected by the VERLORT radar. Orbital injection is initiated by the "D" timer which may also be corrected by the VERLORT radar. The Thor autopilot, without its all-inertial guidance system, is sufficient to meet the mean altitude objective.

III. MIDAS:

1. The first flight of the MIDAS program is scheduled for January 1960 at Atlantic Missile Range. This program will use an Atlas booster known as Atlas/WS117L Satellite Booster. This is a series "D" Atlas missile modified to carry additional payload. For these flights the single tankage Agena presently used in Discoverer with single burn capability will be used. The performance of this combination is shown on Atlas-Agena payload capability curve No. 2.

2. All flights after the second MIDAS will be flown from Pacific Missile Range with the same Atlas booster with additional payload capability modifications. The Agena double tank and restartable configuration that is flown after July 1960 in Discoverer will be used. This configuration will give payload capability as shown in Atlas-Agena curve No. 4.

IV. SAMOS:

1. Samos flights will begin in June 1960 from Pacific Missile Range. The Atlas booster used for these flights will be the same as the original MIDAS boosters. The single tankage Agena will also be used. Performance for this combination is approximated by Atlas-Agena curve No. 1. The approximation is due to the launch azimuth on Samos flights being slightly non-polar. A small degradation of payload from the curve will be required.

2. The objectives of the guidance and control system for the Samos and MIDAS programs call for deviations from the desired orbital eccentricity of less than .01, from the desired mean altitude (200 to 2,000 miles) of less than 10 miles, and from the desired attitude orbit of 2° and ultimately, 0.5°. At first the eccentricity objectives will be met in the same manner as for the Discoverer program and for the third MIDAS or fourth Samos and subsequent by using improved components. These improved components include:

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a. Replace the electrically driven hydraulic pump with a hydraulically driven pump. This hydraulic drive utilizes the rocket engine propellants for the actuating fluid.

b. The rate gyros in the flight control electronic package are replaced by equivalent rate circuitry. This also permits repackaging of the electronic package yielding a smaller and lighter component.

c. The accelerometer-integrator combination will be replaced by an indicating unit with improved performance characteristics. Orbital attitude control objectives will be met at first by use of gravity stabilization and an inertial wheel attitude damping system. Ultimately, a combination inertial wheel-gas jet attitude control system will be employed. Corrective signals will be supplied by the horizon sensor. The Atlas radio inertial guidance system will adequately meet the mean altitude objective.

V. The Agena systems have other capabilities than has been shown for the three programs explained. These capabilities involve change of launch base and change of engine and tankage combinations in the Agena. Additional curves have been supplied for these cases. When the Atlas-Agena is launched from Pacific Missile Range using the dual burning engine developed under Discoverer for flights in April 1960 and combined with the single propellant tankage, the payload capability shown on Atlas-Agena curve No. 3 is possible. If the double tankage Agena and restartable engine used on the MIDAS program and Atlas is launched from Atlantic Missile Range the payload capability shown on Atlas-Agena curve No. 5 is available. When launching Thor-Agenas from AMR, using the post-July 1960 configuration, the performance shown on Thor-Agena curve No. 4 is available.

VI. COMMUNICATIONS SATELLITE:

1. The communications satellite program presently subject to approval has a configuration almost identical to that of MIDAS and as such the Atlas-Agena curve No. 4 gives performance capability. The communication satellite itself will be a third stage carried into orbit by Agena.

2. The objectives of the Agena guidance and control system call for deviations from the desired orbital period of less than 2%. The configuration to meet this objective will be similar to that for Samos and MIDAS. Consideration is being given to the use of improved inertial gyros which may negate the need for a horizon sensor. No orbital attitude control requirement exists for the Agena after separation of the third stage. Attitude control for the third stage will be obtained by low-thrust jets and/or inertial wheels.

VII. The payload capability for space or inter-planetary flight cannot be shown realistically in comparison with altitude. A more reasonable [illegible] injection velocity [illegible] interplanetary requirements vary with the day and year of the desired flight. Predetermination of the day of flight within limits will permit evaluation of the payload capability. The curve for velocity versus weight for probe flights is also inclosed.

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WDZEV/Lt Col Marcus/2594

Discoverer, MIDAS, Samos and Comm Sat (Steer) Configuration and Schedule

OCT 16 1959

WDZD (Colonel Evans)

1. This memo and the attached charts are to meet the requirements of your memo dated 23 September 1959, for written material, as well as briefings, on Agena and booster configurations. The charts are copies of those used in briefing you on 6 October.

2. The major changes that took place between the 22 September briefing and the 6 October briefing are as follows:

a. Eliminate the July flight of MIDAS and reschedule it to October 1960.

b. Make all PMR MIDAS flights double tankage Agenas. This is possible because of the change in the first flight schedule of MIDAS in line with double tankage availability. Vehicle 1012 (the #3 MIDAS vehicle now about 25% complete) will either be scrapped, reworked as a MIDAS dual tank, or assigned as a Samos single tank vehicle. LMSD is preparing a detailed study of the best approach.

c. Make Samos double tank Agenas after the first three Samos flights.

d. Include orbit adjust on all Samos and MIDAS double tank flights.

e. Include solar array on both Samos and MIDAS.

f. Eliminate the use of an intermediate engine (8081) in Samos and go from the standard 8048 (as used in Discoverer) to the advanced 8096 after the third Samos flight.

g. The configuration of the first Atlas booster for use at Pt Arguello will have a static capability of 11,600#. The second and third will have the low loss LOX line and the fourth will have a 4 psi LOX tank pressure to increase load capability to 17,000#. (The first MIDAS at Pt. Arguello will have the 4 psi tank pressure as well). This configuration will hold until about May 61. At this stage the Mod III guidance will be introduced.

h. In going to the 17,000# static load capability by means of the 4 psi LOX tank pressure the stands will be modified to provide a propellant loading system capable of on-loading LOX against the 4 psi pressure. This change will be done after the first three Samos launches from the two pads at Pt. Arguello.

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WDZSM WDZE WDZSD WDZC

ORIGINATOR COORDINATION Lt Col Marcus	WDZSM	[illegible]	[illegible]	[illegible]
DATE 10/14/1959	10/15/59	[illegible]	[illegible]	15 Oct 59

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3. As a result of the 6 Octob[illegible] you [illegible], the following is to be done:

a. We will try to make all PMR Atlas boosters with a 17,000# capability instead of making the change after the 3rd Samos flight (WDZF)

b. A study will be made on the use of the Agena attitude stabilization on COM SAT instead of a separate system on a separated satellite. This study to be presented to you about 6 November. (WDZSC)

c. A briefing will be made to you on the use of the Edwards stand to augment the SCTB stands. (WDZT)

d. A similar configuration briefing will be given to you about 6 November to keep you abreast of the programs. (WDZE)

GEORGE E. AUSTIN
Major, USAF
EDWARD F. BLUM
Lt Colonel, USAF
Director, Astro-Engineering

2 Atch
1. 1 chart, Space Systems Progress, (S) 59 LMSD 4002, 1 pg
2. 4 charts, Configurations, #1 - 4 (C) WDZE 79, 1 pg each

Copies to:
WDZSC
WDZSM
WDZSD
WDZSS
WDZQ
WDZF
WDZT

WDZSC COMMENT: NOTED. NO OBJECTION AT THIS DATE. HOWEVER, CANNOT CONCUR FULLY UNTIL LMSD PROPOSAL FOR COMM SAF IS IN, REVIEWED, AND APPROVED. –

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OF[illegible]TOR COORDINATION		M Lamm	~~SECRET~~		
DATE		[illegible]			

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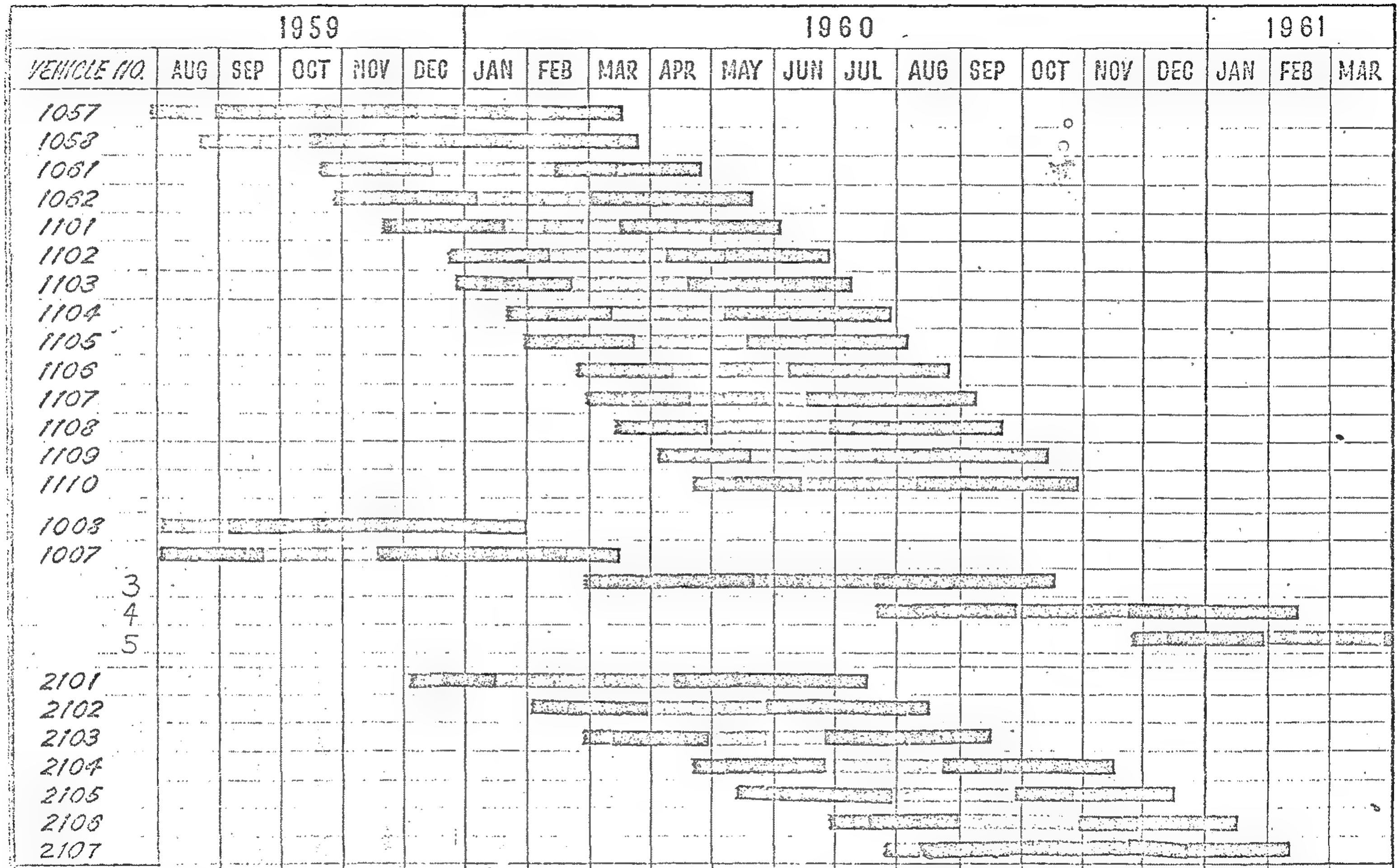
SPACE SYSTEMS PROGRESS CHART



	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
MFG. ▭		1	0	0	1	3	2	3	4	2	2	1	1	2	0	0	0	1	0	0
M+C/O ▭	1	1	1	1	0	0	2	1	3	3	4	2	2	1	1	2	0	0	0	1
SCTB ▭			2	1	1	0	0	2	1	3	3	4	2	2	1	1	2	0	0	0
LAUNCH ▭						1	0	3	1	1	2	3	3	3	3	1	1	1	2	

[redacted]

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CONFIGURATIONS

CHART NO. I

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	FLT. NO.	D		8/9	10/11	12	13	14/15	16/17	18	19	20/21	22/23	24/25	26/27	28/29			COM SAT		1			2		3			4	
		M					1		2							3				4			5		6			7		
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	PAD	D		←						4 & 5								→	(COM SAT)		2			1		2			2	
		M					14		14							2				1			2		1			1		
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	BOOSTER	D		←		A			→	←	B	→	← C			→			COM SAT				γ							
		M					←	α	→							←							γ							→
		S											α	β	β		←						γ							→
SS/A	TANKAGE	D		←		120	SEC		→	←		240 SEC				→			COM SAT				240 SEC							
		M					←	120SEC	→							←					240 SEC									→
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	ENGINES	D		←		80	48		→	←	8081	→	←	8096		→			COM SAT				8096							
		M					←	8048	→							←							8096							→
SS/B		S											←	8048	→		←						8096							→
	ORBIT ADJUST	D										NO							COM SAT							NO				
		M														←							YES							→
		S															←						YES							→
	SOLAR ARRAY	D										NO							COM SAT					(NOT ON AGENA)						
		M														←							YES							→
SS/C		S															←						YES							→
	PRI-(SEC) BATT	D		←			1		→	←		3				→			COM SAT				1							
		M					←	24	→						→	1·4	←						←			0÷4				→
		S											←	12	→		←					5÷1								→

ATLAS CODE: α 11,600 CAPAB. THERMAL LIMIT
β 11600 LOX LINE "
γ 17000 LOX LINE 4 PSI "

THOR CODE: A-PRESENT THOR
B-DM-21(BIK I ENG.)
C- " " " II "

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CONFIGURATIONS

CHART NO 2

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SS/D	PASSIVE SEMI-ACTIVE ACTIVE	D	←— SEMI-	ACTIVE ————→	COM SAT NOT ON AGENA
		M		←PASSIVE→ ←————	ACTIVE ————→
		S		←PASSIVE→ ←————	ACTIVE ————→
SS/EFGL	PAYLOAD	D	←AET→ GRD	BIO ←—— AET ————→	COM SAT SEPARATES
		M		G G G	G G G G
		S		E'_{F_1} E'_{F_1} $E'_{F_{2A}}$ E_2	F_{2B} E_2 F_3 E_2 F_3 E_2 F_3
SS/H	TRACKING	D	←———	ACQ BCN/VERLORT ——→	COM SAT
		M		←ACQ-BCN VERLORT→ UHF EXIT VRLT	←UHF ————→
		S		←ACQ-BCN VERLORT ←——	———— UHF ————→
	COMMAND	D	←———	VERLORT ————→	COM SAT
		M		←VERLORT→ ←————	INTEGRATED UHF COMMAND ————→
		S		←VERLORT→ ←——	INTEGRATED UHF COMMAND ————→
	DATA	D			COM SAT
		M		←VHF→ ←————	UHF/NARROW BAND ————→
		S		←UHF-E VHF-F→ ←——	UHF E WIDE BAND F NARROW BAND ————→
	T/M	D	←———	VHF ————→	COM SAT
		M		←VHF→ VHF/PRIME UHF PAM	←———— UHF ————→
		S		←VHF→ ←——	VHF-PRIME UHF-PAM→ ←———— UHF ————→

PASSIVE - GRAVITY POTEN & PITCH WHEEL & DAMPING WHEELS
SEMI-ACTIVE - GAS & IRP & HORIZON SCANNER
ACTIVE - GAS & INERTIA WHEELS & HORIZON SCANNER

[redacted]

WDZE-79

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

CONFIGURATIONS

CHART NO 3

		59	60	61
		S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
GROSS WEIGHT	D	←8700	→ 15,800 →	COM SAT 16,000 APPROX
	M		←11,400→ 16,800	16,700 16,500 16,500 16,500
	S		←11,100→ ←	E2=11,200 F3=10,300 TO 10,700 →
EMPTY WEIGHT ON ORBIT	D	←1740	→ ← 2230 →	COM SAT NOT APPLICABLE
	M		←4860→ 3200	3120 2910 2860 2770
	S		4100 4100 4010 ←	E2=4230 F3=3790 →
INJECTION ALTITUDE (N.M.)	D	←	104 → ← 174 →	COM SAT 5600
	M		←261→ ←	2,000 →
	S		←261→ ←	E2=261 F3=300 →
ACTIVE LIFE (DAYS)	D	← 1	4 →	COM SAT 365* (SAT)
	M		←22→ ←	365* →
	S		←8.3→ ←	E2=120 F3=365* →

* DESIGN GOAL

~~SECRET~~

WDZE-79

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

VEHICLE STATUS - OCT. 1, 59

VEHICLE		POSITION	% DESIGN COMPLETE	% MANUFACTURING COMPLETE
SAMOS	2101	MFG	95%	45%
	2102	"	"	20%
	2103	"	75%	10%
	2104	"	30%	5%
	2105	"	25%	3%
	2106	"	10%	
MIDAS	1008	SCTB	100%	100%
	1007	MOD & C/O	100%	100%
	1012	MFG	80%	25%
	1201	MFG	30%	
DISCOVERER	1053	MOD. & C/O (VAFB)	100%	100%
	1056	MOD. & C/O (VAFB)	"	"
	1055	SCTB	"	"
	1058	MOD & C/O	"	"
	1057	SCTB	"	"
	1061	MFG	80%	25%
	1062	"	80%	25%
	1101	"	80%	10%
	1102-1110		80%	

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AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

56

REPLY TO ATTN OF: WDPCR

9 November 1959

SUBJECT: Modification of AGENA Vehicle, 31 October 1959

TO: Director
Advanced Research Projects Agency
Washington 25, DC

102

1. This report, covering progress during the month of October 1959, is the fourth to be submitted under ARPA Order No. 96, dated 1 July 1959, (Project Code No. 3600). This work was formerly directed by Task 3 of Amendment No. 4 to ARPA Order No. 17. Order No. 96 calls for the modification of the AGENA upper stage vehicle to obtain single engine restart capability and increase propellant capacity.

2. TECHNICAL STATUS

a. PROPULSION

(1) Delivery of the first propulsion test vehicle assembly engine to LMSD, scheduled for October, has slipped about 30 days. This delay resulted from several minor engineering problems which accumulated throughout engine development. All such problems have been resolved. This slippage will not result in delays to the launch dates of any program using this vehicle.

(2) The two preliminary flight rating test engines will be available to start the PFRT program during November. Delivery of the first flight engine to LMSD is scheduled for the latter part of November.

(3) A total of 20,164 seconds of development and production testing have been accumulated on the turbine pump assembly; 7,250 seconds at thrust chamber level, and 398 seconds at production engine level.

(4) A technical direction meeting was held on 30 October at which the engine contractor presented the current status of the program.

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WDPCR-97

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b. AIRFRAME

The first two double capacity propellant tanks have been completed. Inertial qualification tests on both tanks will begin on 16 November in the centrifuge at Sandia Base, New Mexico. The tanks will then be shipped to LMSD for 90 pressure cycling and slosh structural qualification tests. Slosh tests on the mock-up tank have resulted in selection of a baffle design consisting of radial screens in all hemispherical sections and perforated truncated cones in the cylindrical section. Tests, using this design, are being continued to establish control system constants.

3. PROBLEMS ENCOUNTERED

No problems other than routine technical problems have been encountered.

4. WORK SCHEDULES

Work schedules, except as noted in Par 2, are compatible with program schedules.

5. ARPA ACTION REQUIRED

None.

Harry P. Evans
for O. J. RITLAND
Maj. Gen., USAF
Commander

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Assistant CINCSAC (SAC MIKE)	1
Air Force Ballistic Missile Division (ARDC)	20

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COORDINATION SHEET

TYPIST INITIALS	PERMANENT	
	TEMPORARY	

WDZEH/LtColSmith/2741

Discoverer/Samos/Midas/Comsat/Agena Configurations

NOV 13 1959

WDZS

1. This letter is in reply to WDZS letters dated 29 September and 21 October 1959 seeking possible solutions for a common Agena Vehicle and examining the necessity for an Agena Configuration Control Board.

2. A letter to Lockheed Missile Systems Division for signature is attached. Its purpose is to assure the Air Force of a common Agena vehicle in so far as possible without unduly compromising performance of the various missions and to assure that Lockheed will recommend controls that will maintain a common vehicle during the continuing development phases of the subject programs.

3. ARDCMR 11-9 regarding the establishment of a Configuration Control Board (CCB) has been studied. An explanatory meeting by WDZH held 10 September 1959 on the same subject was attended. It was learned that the regulation, though new, has met no opposition from Headquarters or other Commands, and seems well established. It is designed for a single weapon or space system, whereas our organization recognizes four using a common vehicle. The CCB is normally established by the Weapon System Manager at the initiation of a Weapon System project. It is suggested that a CCB be established at WDZS level eliminating the need for a Board for each of the four systems. A member of each System office could be designated as a working member to obtain coordination for his System. Members of WDZE, WDZT, WDZQ, LMDJ could also be assigned as participating members. To eliminate the burden of this action on WDZS the Acceptance Team Chairman could be designated as Alternate Chairman for the CCB.

4. It should be noted that the early actions of the CCB as required by ARDCMR 11-9, Para. 4c.(1) are now accomplished by members of WDZE, WDZQ, CSAT, and LMDJ in their normal duty functions as members of the AF Acceptance Team. The vehicle is inspected and accepted by members of the above group. Engineering changes are reviewed and approved by interested members of the same group. The Chairman of the Acceptance team also acts as coordinator for all Engineering changes taking place following vehicle acceptance. Since the nucleus of a CCB is already in action it would be formalized and become the CCB.

ORIGINATOR COORDINATION					
DATE Oct 59	WDZER	WDZSD		WDZX	6 Nov 59

COORDINATION SHEET

TYPIST INITIALS		
	PERMANENT	
	TEMPORARY	

5. This solution is recommended as a temporary one lasting for about one year. By this time the four programs may reorient or become sophisticated enough to require one or more CCD's.

SIGNED

EDWARD F. [illegible]
Lt Colonel, USAF
Director, Astro-Engineering

1 Atch
Ltr, BMD, Agena Configurations for Discoverer, Samos, MIDAS and Communication Satellite Systems (U) [illegible]

9 Nov 59

ORIGINATOR COORDINATION	[illegible]	[illegible]	[illegible]		
DATE	[illegible]	[illegible]	[illegible]		

R&D 5-4

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AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDZS/Col Oder/1822

SUBJECT: Discoverer/Samos/Midas/Comsat/Agena Configurations

NOV 17 1959

TO: WDZE

1. Reference WDZE memo to WDZS, 13 November 1959, subject as above. I concur with your proposed course of action and have signed the letter to LMSD.

2. Please proceed with the administrative actions needed to establish an AGENA CCB. While I recognize this as an across-the-board WDZS matter, I believe that the major action element is WDZE in support of WDZS; accordingly I propose that the board function under the Alternate Chairman (last sentence, par 3, your memo) unless there arises need for resolution between the WDZS elements involved. WDZS will chair the board only when such items are on the agenda.

FREDERIC C. E. ODER
Colonel, USAF
Assistant Deputy Commander
Space Systems

Copy to:
WDZ w/cy WDZE memo

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P 59

ADVANCED RESEARCH PROJECTS AGENCY
WASHINGTON 25, D. C.

ARPA Order No. 96-60
Amendment No. 2
Project Code No. 3600

December 3, 1959 Date

109

TO: Commander
Air Research and Development Command
Andrews Air Force Base
Washington 25, D. C.

In accordance with the Secretary of Defense memorandum dated November 17, 1959, responsibility for the work covered by ARPA Order No. 96, as amended, is hereby released to the Secretary of the Air Force.

Title to equipment and facilities procured under this Order is hereby transferred to the Department of the Air Force.

The Secretary of the Air Force will supply to ARPA a quarterly progress report for the quarter ending December 31, 1959, as final fulfillment of the reporting requirements under this Order.

FY 1960 funds available for this project are being transferred to the Air Force by OASD Comptroller action.

Funds available on this Order under appropriation and account symbol "97X0113.002 Salaries and Expenses, Advanced Research Projects Agency, Department of Defense" are hereby reduced by $4,250,000 from $4,250,000 to zero. Any costs pertaining to the work covered by this Order in excess of funds remaining on this Order shall be chargeable to Air Force accounts and are not in any way chargeable to ARPA.

FY 1959 funds in the amount of $900,000 for this work were made available under ARPA Order No. 17.

4.25
.9
5.15

Don R. Ostrander
Don R. Ostrander
Maj. Gen., USAF
Acting Director

Copy to: Secretary of the Air Force

R&D 1-2 60

HEADQUARTERS
AIR FORCE FLIGHT TEST CENTER
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
EDWARDS AIR FORCE BASE, CALIFORNIA

REPLY TO ATTN OF: FTRDL
Capt. W. J. Stauffer/8-28221

SUBJECT: Engine Model Designations

DEC 18 1959

TO: Air Force Ballistic Missile Division
Hq Air Research Development Command
Air Force Unit Post Office
Los Angeles, Calif.

Attn: WDZEP, Lt. Col. Worthington

1. The following actions requested by WDZEP were accomplished by the Status Nomenclature Branch, Equipment Control Division, Directorate of Engineering Standards, Wright-Patterson AFB, Ohio:

a. The model designation of the XLR81-BA-5 was changed to YLR 81-BA-5 on 15 April 1959.

b. The Bell Aircraft Corporation Model 8081 Rocket Engine was designated XLR-81-BA-7 on 23 November 1959.

2. The Bureau of Aeronautics has requested that a copy of the YLR 81-BA-5 engine model specification be transmitted to the Bureau, when available. The copy should be addressed to Chief, Bureau of Aeronautics, Department of the Navy, Washington, 25, D.C., Attn: AER-PP-1521/29.

FOR THE COMMANDER:

HAROLD W. NORTON, Colonel, USAF
Director, Rocket Propulsion & Missiles

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AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

Responsibility released to AF 17 Nov 59

61

REPLY TO ATTN OF: WDLPM-4

22 December 1959

SUBJECT: Modification of AGENA Vehicle, 30 November 1959

TO: Director
Advanced Research Projects Agency
Washington 25, DC

also report 12 Feb 1960

1. This is the final report to be submitted under ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). The report covers progress during the month of November 1959. ARPA Order No. 96 directs the modification of the AGENA upper stage vehicle to obtain single engine restart capability and increase propellant capacity. Amendment 2 to ARPA Order No. 96 releases program responsibility to the Secretary of the Air Force. Funds available under the order were reduced by amendment No. 2 from $4,250,000 to zero.

2. TECHNICAL PROGRESS

a. Centrifugal testing of the AGENA "B" test article propellant tanks has been completed satisfactorily and vibration testing is now in progress. Tank design stressed use of components proven in the AGENA "A". For manufacturing simplicity, hemispherical ends were made uniform except for material thickness. This permitted the use of straight cylindrical sections between end pieces which are machined flat, then rolled into cylinders.

b. The AGENA "A" engine (8084) will be used for test procedures until the AGENA "B" engine (8081) becomes available. The 8081 will incorporate two solid propellant turbine starters and necessary electrical modifications. The main pressure regulator fuel and oxidizer vent devices have been redesigned, developed and produced for the propulsion system. This unit will be tested during the propulsion test vehicle assembly program now in progress at the Lockheed Sunnyvale facility.

c. Massachussetts Institute of Technology progress on development of an advanced orbital attitude control system for the MIDAS/SAMOS and AGENA configuration was reviewed in November. Pitch control appears to pose no immediate problem, however, roll-yaw, controlled mainly by a large gyro, will present difficulties for the following reasons:

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DOD DIR 5200.10

WDLPM-4-118

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1. The gyro size depends to some extent on the vehicle inertias which are not constant at this time.
2. A survey indicates that even the most suitable gyro available will require considerable modification.

Kearfott has been selected as the gyro contractor.

3. PROBLEMS ENCOUNTERED

No significant problems were encountered during this reporting period.

4. WORK SCHEDULES

Work progress remains compatible with launch dates for vehicles using the modified AGENA stage.

5. ARPA ACTION REQUIRED

No ARPA action is required.

RW Curtin
for

O. J. RITLAND
Major General, USAF
Commander

Copies to:
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AIR FORCE BALLISTIC MISSILE DIVISION
FIELD OFFICE

HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Post Office Box 1567
Vandenberg Air Force Base, California

REPLY TO ATTN OF: WDGEV-6/Captain Lefstad/8-37[illegible]

SUBJECT: Procedure for Coordination of Discoverer Engineering Approvals

JAN 5 1960

TO: Comdr, AFBMD, HEDARDC
ATTN: WDZN
Air Force Unit Post Office
Los Angeles 45, California

1. As a result of a meeting at this office between Lt Colonel Smith (WDZN) and members of the Satellite Systems Division, AFBMD Field Office, the enclosed suggested procedure is forwarded for your coordination and approval.

2. The first report mentioned in paragraph c was forwarded from this station on 28 December 1959.

JOSEPH J. CODY, JR.
Colonel, USAF
Chief, AFBMD Field Office

1 Atch
Report, Subj: Procedure for Coordinating Approvals on Engineering Modifications to Agena Vehicles at Lockheeds Facility at Vandenberg AFB

113

Procedure for Coordinating Approvals on Engineering Modifications to Agena Vehicles at Lockheeds Facility at Vandenberg AFB

A. The AFBMD Field Office, Satellite Systems Division, will be notified by phone as soon as possible, when the Directorate of Astro-Engineering (WDZN), Ballistic Missile Division (ARDC) has determined that a modification suggested by the contractor is approved for accomplishment on a vehicle in work at Vandenberg AFB.

B. The AFBMD Field Office will monitor projected work schedules, keeping aware of new modifications (EJA's), planned for accomplishment on Agena Vehicles in work at Vandenberg AFB. In the event that the AFBMD Field Office has not been notified of the approval of an EJA scheduled for work, the contractor will be requested to delay the work until approval can be assured.

C. The AFBMD Field Office will keep WDZN informed of the daily progress of all vehicles in work at Vandenberg AFB. This report will be an information copy of a TWX presently being sent to the 6594th Test Wing, Palo Alto, California.

RVD 4

67

WDZNE

(WDZNE/Lt Col Smith, Jr/2741)

JAN 19 ~~1959~~ 1960

Control of Agena Vehicle Changes Following AF Acceptance

WDZM WDZP

1. With reference to the attached AFBMD Field Office letter dated 5 Jan 60 this Division is planning to further tighten the control of Lockheed Engineering Job Analysis (EJA) documents.

2. The configuration of the Agena vehicle as accepted by the Air Force is defined by the general specifications. This specification in turn defines the top design drawings, performance, design reliability and test requirements which further describes the vehicle. Generally at time of acceptance there are some discrepancies which must be corrected. These "squawks" are listed on an attachment to the form DD250 and completes the definition and status of the vehicle. From this point on the vehicle belongs to the Air Force and any modifications should have Air Force approval.

3. Since the Agena vehicle is still in an R&D status minor engineering changes will continue to occur after Air Force acceptance and before launch. This fact is recognized however it is believed that all changes should be held to a necessary minimum. In order to accomplish this Lockheed will forward EJA's for approval of AFBMD. These EJA's will be coordinated among the cognizant subsystem engineers and project officers and an approving TWX will be sent to Lockheed and the proper AFBMD Field Office. In this way the field office will have a record of approved EJA's and will allow the contractor to complete the work.

4. In some cases, due to lack of time, it may be necessary to do a major portion of this coordination by telephone. In this case AFBMD personnel coordinating EJA's by telephone should contact WDZNE and indicate the EJA number, title and vehicle effectivity so that records may be maintained and the field office notified of the approval. In the event WDZNE is not available, Lt Col Keisler, WDZNV should be notified of any approvals by calling Vandenberg AFB, 8739.

	ORIGINATOR				
SYMBOL	WDZNE				
ME (SIGNATURE)	LT COL SMITH, JR/gb				
	14 Jan 60				

5. A list of all approved ECA's by applicable vehicle as well as initial acceptance documents will be maintained on current vehicles by WDZNE in Bldg. 3, Room 459.

6. Your concurrence with this procedure is requested.

SIGNED SIGNED

EDWARD F. DUNN
Lt Colonel, USAF
Director, Astro-Engineering

1 Atch.
Ltr fr AFBMD Field Ofc, Vandenberg AFB, dtd 5 Jan 60 w/1 atch, Rpt, subj: Proc. for Coordinating Approvals on Engr Mod to Agena Vehicles

COPIES TO: WDZYE
WDZYD
WDZYA
WDZDS

OFFICE SYMBOL	ORIGINATOR WDZNE					
NAME (SIGNATURE)	LT COL SMITH, JR/gb					
DATE						

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AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDLPM-4

SUBJECT: AGENA Program Progress Report as of 31 January 1960

12 February 1960

TO: Director
Advanced Research Projects Agency
Washington 25, DC

117

1. This report, covering progress during January 1960, is submitted in accordance with ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). Order No. 96 directs the modification of AGENA upper stage vehicle to obtain single restart capability and increase propellant capacity.

2. TECHNICAL PROGRESS

a. One XLR81-Ba-7 engine (Bell Aircraft Model 8081) is at the Santa Cruz Test Base for hot firing tests in the AGENA propulsion test vehicle assembly. Three full duration runs were made during January. The engine was operated for 236, 251, and 245 seconds during these tests. The XLR81-Ba-7 engine will be installed in the first four AGENA "B" vehicles scheduled for the DISCOVERER Program.

b. Preliminary flight rating tests of the XLR81-Ba-7 engine have been started at Bell Aircraft and are scheduled for completion late in February.

c. Pressure cycling tests on the double-capacity integral propellant tanks have been completed successfully.

3. PROBLEMS ENCOUNTERED

No significant problems were encountered.

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4. WORK SCHEDULES

The first AGENA "B" vehicle for use in the DISCOVERER program is in the LMSD Modification and Checkout Center. It is scheduled for shipment to Santa Cruz Test Base on 24 February.

5. ARPA ACTION REQUIRED

No ARPA action is required at this time.

R Curtin for

O. J. RITLAND
Major General, USAF
Commander

Copies to:
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R&D 2-65

FEB 23 1960

AFDRD

Augmentation of Propulsion Program

ARDC (RDR)
Andrews AFB, Washington 25, D. C.

1. The recent review of the Air Force propulsion R&D program by the Under Secretary of the Air Force resulted in a decision to increase the FY 60 funding in the propulsion area, with a corresponding increase in the planned level of effort in FY 61. The means to be used to augment funding for propulsion are (a) obtain funds from the Secretary of Defense Emergency Fund, (b) use system funds for engine developments needed to support specific systems and (c) reprogram within the RDT&E program.

2. Referring to the list of items recommended for additional funding in the 12 February 1960 propulsion presentation to Under Secretary Charyk, the following action is to be taken:

a. OSD Emergency Funding. A request will be made for funds to support a twin-chambered Nomad, the pressurized storable engine project, and Phoenix/Aurora. The request will be for funds to support a definable unit of work, or "phase", rather than effort over some discrete period of time. For each of the above projects, the defined unit of work will correspond to the funding required for that project for the remainder of FY 60 and for FY 61. The total will be not more than $30 million. ARDC should supply this Headquarters with the information required to be included in the request for emergency funds, as described in the inclosed memorandum from the Director of Defense Research and Engineering. It is not desirable to delay the initiation of the request until all of the information called for in the inclosure is available, particularly in the case of Nomad. Your action will, therefore, be to (1) forward immediately an outline of the three projects, and as much detail as is immediately available, to permit early initiation of the request. The minimum information that will be acceptable is that which clearly describes the objective, the approach, and the plan for the described phase of the work. (2) Continue efforts on an expedited basis, to fulfill the complete requirements of the inclosure, for subsequent submission of additional information to DOD. Part 2a.(1) of the above action should reach this Headquarters not later than 7 March 1960.

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DOD DIR 5200.10

Cy for AFBMD
Cy for AFFTC

~~[illegible]~~

~~CONFIDENTIAL~~

Ltr to ARDC ([illegible]), Subj: Augmentation of Propulsion Program, Cont.

b. System Funding.

(1) LR 81 (Agena). If it is determined by ARDC that improvement of this engine can be justified on the grounds of increased performance for Samos, Midas and the communications satellite, the engine work should be supported by one or more of these system programs.

(2) Low Altitude Ramjet. Effort in this area is not warranted unless there is a system development requiring such an engine, in which case the engine work will be included in the system funding.

c. Reprogramming. The following items are to be augmented an undetermined amount by reprogramming RDT&E funds. The Office of the Under Secretary will direct a portion of this reprogramming action.

(1) Light Weight Gas Generator. $5. million is being added to Project 3066 by Headquarters Program Adjustment No. 60-40-600, now being processed. It is anticipated that approximately $7. million more will be reprogrammed.

(2) Hypersonic Ramjet/LACE. Reference letter from this Headquarters dated 18 February 1960, subject: "Additional FY 60 Funding for Ramjet Technology", which cited reprogramming action.

(3) Electrical Propulsion. Action to be taken as to additional funds has not been determined.

(4) Basic Research. Action to be taken as to additional funds has not been determined.

d. Additional Funding Disapproved. The LR 109 engine program will not be further supported. Following ARDC's discussion with NASA relative to the possibility of coordinating the termination of the remaining effort on the LR 109 with an increase in effort on the F-1 program, ARDC should officially notify Rocketdyne of the Air Force's intention.

Atch
Cy Memo DDR&E, 13 Nov 59

~~[illegible]~~

1c 1991

recd AFBMD
27 Feb 60

66

~~SECRET~~/FROM AFABF AND AFDDP 73993 "CAT AC"

THIS MSG IN THREE PARTS. PART I. THE OSD HAS APPROVED THE ESSENTIAL R&D PROGRAM FOR FY 60 AS INCLUDED IN DEVELOPMENT PLANS AS PRESENTED BY AFBMD. THERE FOLLOWS PROGRAM FUND AMOUNTS FOR FY 60 BY WEAPON SYSTEM:

DISCOVERER	$ 71.1 MILLION
SAMOS	$160.0 MILLION
MIDAS	$ 51.2 MILLION

PROCUREMENT AUTHORIZATION IS BEING ISSUED TO HQ ARDC THIS DATE. BUDGET AUTHORIZATION AND NECESSARY ALLOCATIONS WILL BE ISSUED BY

PAGE TWO

DIRECTOR OF BUDGET. NO APPROVAL HAS BEEN GIVEN FOR THE OPERATIONAL/ DEVELOPMENT PROGRAM AND UTILIZATION OF FY 60 FUNDS FOR THESE PURPOSES ARE NOT AUTHORIZED.

PART 2. IT IS DESIRED THAT ACTION BE TAKEN TO PRODUCE 12 ADDITIONAL THOR/DISCOVERER VEHICLES AND 12 THOR/SPACE VEHICLES. THESE VEHICLES WILL BE SCHEDULED AT TWO PER MONTH NOV 1960 THRU MAY 1961. IN ADDITION, PROVISION WILL BE MADE TO RE-WORK PRESENT 10 THOR MISSILES IN PRODUCTION FOR 5TH SQD. REQUIREMENTS TO A THOR/SPACE CONFIGURATION AT A TWO PER MONTH RATE BEGINNING IN APR 1961 AND CONTINUING THRU AUG 1961. FUNDS IN THE AMOUNT OF $2.5 MILLION ARE BEING ISSUED IN THE DISCOVERER PROGRAM FOR THIS PURPOSE. IN THE EVENT A DIFFERENT SCHEDULE IS REQUIRED FOR MOST ADVANTAGEOUS AND ECONOMICAL PRODUCTION OF BOOSTER REQUEST THIS HQS BE NOTIFIED AS TO REVISED SCHEDULE. IN ADDITION, $2.5 MILLION IS BEING ISSUED TO PROTECT THE LEAD TIME ON FOUR ADDITIONAL AGENA SECOND STAGE VEHICLES THESE FUNDS AND BOOSTER REQUIREMENTS

CLASSIFICATION CHANGED TO
Unclassified
Authority of DD 254 AUG 30 1961
Date 15 SEP 1961

~~SECRET~~

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HOWEVER WILL BE SEPARATELY IDENTIFIED WITHIN THE DISCOVERER PROGRAM.

PART 3. RELEASE OF FY 60 FUNDS AS INDICATED IN PART 1 ABOVE DOES NOT CONSTITUTE APPROVAL OF THE FY 61 PROGRAM FOR SAMOS. ALL

PAGE THREE

ACTIONS TAKEN WITH FY 60 FINANCING WILL BE COMMENSURATE WITH A CAPABILITY TO REVISE CERTAIN PORTIONS OF THE SAMOS PROGRAM PRIOR TO 1 JUL 60 ASSUMING PRIORITY FOR VARIOUS ELEMENTS OF PROGRAM AS STATED IN PRESENTATION BY AFBMD.

CLASSIFICATION CHANGED TO
Unclassified AUG 30 1961
By Authority of DD254
By [illegible] Date 15 SEP 1961

DOWNGRADED AT 3 YEAR INTERVALS; DECLASSIFIED AFTER 12 YEARS. DOD DIR 5200.10

D-67

LOCKHEED AIRCRAFT CORPORATION
MISSILES and SPACE DIVISION

In reply refer to:
LMSD/354592/62-41

4 March 1960

Subject: Standardization Provisions in the Agena Configurations - Interim Report

To: AFBMD (WDZEE)
Air Force Unit Post Office
Los Angeles 45, California

Reference: (A) AFBMD Letter WDZEE/Lt. Col. Smith/2641, subject "Agena Configurations for Discoverer, Samos, MIDAS and Communication Satellite Systems" dated 17 November 1959

(B) LMSD TWX to AFBMD, Same subject, serial LMSD/354627 of 26 February 1960

Enclosure: (a) Tables I through IX, providing categorical lists of equipments that are common to the Discoverer, MIDAS and Samos Programs, valid as of 1 January 1960 (12 pages)

1. Reference (A) stressed the need for a practical common-vehicle policy in fulfilling the several programs. LMSD was requested to provide categorical information which would enhance the understanding of the factors involved. This letter provides an intermediate reply, as mentioned by our acknowledgement, Reference (B).

2. In close liaison with representatives of the AFBMD/AFBMC management team, LMSD has generated a uniquely concerted total effort, considering the functional diversity stipulated for the Agena programs. Three programs - Discoverer, MIDAS and Samos - call for the performance of six grossly dissimilar operational functions at three different altitudes on orbits varying from polar to equatorial. Additionally, the versatile Agena must accommodate boosters of radically different capabilities and permit adaptations for widely differing control refinements.

3. It follows that Agena's prescribed functions could not be fulfilled reasonably by designing one absolute structure. Yet, as emphasized by Reference (A), the fundamental factors of cost, complexity and quantity demanded attention by way of simplification. Paradoxically, the very scope of the aggregate programs precluded the single do-all vehicle as a seemingly ideal solution to the problems allied with that scope. Resolute acceptance of that fact sponsored a better solution.

Ref: LMSD/354592/62-41
4 March 1960

Subject: Standardization Provisions in the Agena Configurations - Interim Report

To: AFBMD (WDZEE)

4. The orbital vehicle is an assembly of a number of module-type structures and equipments. This mode of fabrication would prevail even if there were only one program with one functional objective. As implied before, the vehicle configurations differ between programs mainly because of variances in payload (wt. and size factors), total weight and thrust (stress factors), and specialized equipment requirements (fairing, bracketry and volumetric factors). It became clear that the key to inter-program efficiency lay not in the design of some all-purpose structural envelope, but in careful structural modulization to permit standardized tooling.

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5. Maximum interchangeability of major tooling between programs provides all of the obvious savings to be realized in tooling costs and production aspects, yet restricts none of the necessary provisions for specialized assembly. Such a design policy is the practical equivalent of a strictly common-vehicle objective. In addition, it offers one cardinal advantage: Agena is readily and neatly adaptable to new program objectives or even to new programs by simply employing alternate or add-on "modules" with the useable bulk of the existing design.

6. Enclosure (a), a set of nine tables, does not respond directly to Reference (A), but is provided now as an informal document to augment this interim report. The information was accurate as of 1 January 1960. The tables list all (but only) the equipment which is common to two or more programs. Tables VI through IX pertain to ground equipment. It will be noted that, like vehicle equipment, most of the ground equipment items are used across-the-board. The reasons for the exceptions are nearly all self-evident peculiarities which are chargeable to booster, payload or launch control requirements.

7. The primary design objective of structural interchangeability (Inter-program utility of major tooling design) is safeguarded by two distinct and authoritative activities. The manager of subsystem A has the foremost responsibility in this task. Special emphasis on that point was given by a joint proclamation last year signed by the Program, Vehicle Development and Systems Integration Managers. All design changes are also formally checked against this design policy as a standing responsibility of an independent activity which was established last September. Responsible directly to the Satellite Systems Engineering Manager, the Development Division Change Filtering Group membership is noteably well-equipped to insure observance of design policy with respect to design changes at any point in the schedule.

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ground equipment

Agena B

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TO. AFBMD
ATTN / WDZYD/
INFO. AFBMC
BT
~~S E C R E T~~ ... LMSD/354768
SUBJ. FACILITY CHECKOUT VEHICLE FOR DISCOVERER CMMA SAMOS AND MIDAS - 2 X TANKS

THE CHANGEOVER FROM THE 1X TO THE 2X TANK CONFIGURATION IN DISCOVERER COMMA SAMOS AND MIDAS REQUIRES CHANGES IN THE PAD EQUIPMENT AND OPERATING PROCEDURES. AS HAS BEEN DISCUSSED WITH MAJOR PLUMMER COMMA LMSDS EXPERIENCE INDICATES THAT WHEN SEVERAL CHANGES ARE MADE TO PAD AND VEHICLE EQUIPMENT AND TO OPERATING PROCEDURES PRE-LAUNCH TESTING SHOULD BE ACCOMPLISHED WITH A LOW COST FACILITY CHECKOUT VEHICLE /FCV/. THIS PROVIDES AN OPPORTUNITY TO TRAIN PERSONNEL IN THE OPERATION OF THE EQUIPMENT IN ADDITION TO LOW RISK QUALIFICATION OF THE EQUIPMENT AND PROCEDURES. A SINGLE VEHICLE WITH TWO INTERCHANGEABLE SKIRTS USABLE BY DISCOVERER COMMA SAMOS AND MIDAS IS PROPOSED.

THE SCHEDULE FOR PTVA TESTS AT SANTA CRUZ MAKES AVAILABLE PTVA 0001 ON 1 MARCH AND THUS PROVIDES A RELATIVELY CHEAP SOURCE FOR A FCV. MODIFICATIONS TO THIS VEHICLE REQUIRED TO MAKE IT USABLE AS A FCV ARE DESCRIBED IN PROPOSAL LETTER COMMA LMSD 354163 "FACILITY CHECKOUT VEHICLE FOR DISCOVERER COMMA MIDAS AND SAMOS DATED 29 FEBRUARY 1960 COMMA CLASSIFIED ~~SECRET~~.
END PAGE 1.

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PAGE 2 / CONT/

THE CHANGES WHICH NECESSITATE ADDITIONAL CHECKOUT INCLUDE THE FOLLOWING CLN

FOLLOW ON DISCOVERER

1. THE PAD MAST EXTENSION WILL BE CHANGED.
2. THE RIGGING BETWEEN THE MAST AND VEHICLE WILL BE NEW.
3. THE PROPELLANT LOADING PROCEDURES WILL BE DIFFERENCT CLN /A/ A COMBINATION OF DUMP TRUCK AND TRAILER WILL BE USED SIMULTANEOUSLY FOR PROPELLANT LOADING AND DURING OXIDIZER DUMP WHEREAS CURRENTLY THIS EQUIPMENT IS USED SINGULARLY CLN /B/ DOUBLE THE AMOUNT OF PROPELLANTS WILL BE USED CLN /C/ THE LOCATION OF THE FUEL AND OXIDIZER IN THE FOLLOW ON VEHICLES HAS BEEN REVERSED.

SAMOS AND MIDAS 2X TANK CONFIGURATION

1. THE MAST VALVES AND PLUMBING WILL BE MODIFIED.
2. DOUBLE THE AMOUNT OF PROPELLANT WILL BE USED.
3. THE LOCATION OF THE FUEL AND OXIDIZER IN THE 2X TANK CONFIGURATION HAS BEEN REVERSED.

THE USE OF A FCV REDUCES SIGNIFICANTLY THE RISK OF COSTLY DAMAGE TO FLIGHT VEHICLE IN THAT CLN

1. NONVOLATILE LIQUID SUCH AS WATER CAN BE USED FOR INITIAL PROPELLANT LOADING DUMPING AND PRESSURIZATION TESTS. THIS REDUCE HAZARDS FROM LINE BREAKS AND POSSIBLE FIRE SHOULD THE PROPELLANT BULKHEAD REVERSE AND BREAK AND OFFERS A SAFETY FACTOR TO EQUIPME AND PERSONNEL. SUCH REVERSALS WERE EXPERIENCED WITH THE FCV BEING USED DURING PAD CHECKOUT AT PATRICK AFB.

END PAGE 2

PAGE 3 / CONT/

2. UMBILICAL DROP PERFORMANCE CAN BE CHECKED
3. HIGH PRESSURIZATION CONTROL AND VENTING CAN BE CHECKED
4. SAMOS AND MIDAS VEHICLES CAN BE SIMULATED DURING ATLAS FLIGHT READINESS FIRINGS.

F. W. O GREEN FOR R. SMELT
MANAGER SATELLITE SYSTEMS
LOCKHEED MISSILE AND SPACE DIVN
208P JC..

"A-PARAPHRASE NOT REQUIRED EXCEPT TO CATEGORY B ENCRYPTION - PHYSICAL MOVE ALL INTERNAL REFERENCES BY DA GROUP PRIOR TO DECLASSIFICATION."

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Cy Nr 69

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDLPM-4

SUBJECT: AGENA Program Progress Report as of 29 February 1960

8 March 1960

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during February 1960, is submitted in accordance with ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). Order No. 96 directs the modification of the AGENA upper stage vehicle to obtain single restart capability and increased propellant capacity.

2. TECHNICAL STATUS

a. The propulsion test vehicle assembly and preliminary flight rating test programs for the XLR81-Ba-7 engine development were essentially completed during February. Only a formal review of test results and altitude chamber testing remain to complete this development program. The formal review of test results was started at LMSD on 29 February. The altitude chamber testing program will be conducted at the Arnold Engineering Development Center within the next 45 days. The XLR81-Ba-7 engine will be used in the first four AGENA "B" vehicles scheduled for the DISCOVERER Program. All four flight model engines have been delivered to LMSD.

b. Thrust chamber cooling for the XLR81-Ba-7 engine has proved to be critical during continuous 240 seconds firing under certain conditions of coolant ambient temperatures and IRFNA solids content. The contractor's development effort is being continued to alleviate this condition. In the interim, satisfactory chamber cooling can be obtained by close control of solids content and ambient temperatures (70 degrees or below) of the IRFNA.

c. All development effort programmed for the double capacity integral propellant tanks has been completed successfully.

3. PROBLEMS ENCOUNTERED

No significant problems were encountered during the month.

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WDLPM-4-185

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3. PROBLEMS ENCOUNTERED

No significant problems were encountered during the month.

4. WORK SCHEDULES

All work is currently on schedule.

5. ARPA ACTION REQUIRED

No ARPA action is required at this time.

Harry L. Evans
for O. J. RITLAND
Major General, USAF
Commander

Copies to:
See attached Distribution

COPY

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

9 March 1960

7C

REPLY TO ATTN OF: WDZY/Col Oder/1822

SUBJECT: Reliability Testing of Agena Subsystems by Air Force Agencies

TO: WDZM

1. In a recent presentation by WDTT to Colonel Cartin on our Military Test and Evaluation Capability (MTEC) it was noted that there is a ptoential capability for the subject tests as follows:

a. Rocket Propulsion at EAFB

b. Inertial Guidance at the Central Inertail Guidance Test Facility, HAFB

2. The question naturally arises as to the necessity and/or desirability of initiating a reliability testing program for AGENA subsystems by these agencies; specifically the XLR-3-BA-9(8096) engine plus remainder of propulsion subsystem and the inertial components of AGENA guidance.

3. Request you investigate this matter and furnish recommendations and estimated costs to this office NLT 31 Mar 1960.

Frederic C. E. Oder
FREDERIC C. E. ODER
Colonel, USAF
Assistant Deputy Commander
Space Systems

Copy to:
WDZ
WDZD
WDZYM
WDZYD
WDZYE
LMEJ
WDZT

Indorsement
If ~~inclosures~~ are withdrawn (or not attached) the classification of this correspondence will be uncl

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R&D

Ltr, WDZT, 9 Mar 60, Reliability Testing of AGENA Subsystems by Air Force Agencies APR - 5 1960

1st Ind (WDZR/Lt Col R. C. Smith, 29/2761)

TO: WDZT

1. This letter is in reply to your letter of 9 Mar 60, which was written as a result of a WDZT presentation regarding the Air Force Test and Evaluation Capability in certain areas and whether Agena subsystems should be tested in these facilities.

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2. The philosophy surrounding reliability versus operational testing should be discussed. In aircraft systems, there has usually been a clear division in these areas. Reliability testing is generally done by the contractor or sub-contractor, on a subsystem whereas operational testing was conducted by ARDC and in some cases by the operating command on the complete aircraft. The advantages were two fold. One, reliability testing by the contractor resulted in a better understanding by him of his product, as well as providing quick corrective engineering changes. Two, the system was tested in an operational environment by personnel who would use the system. The distinction between the objectives of these two types of testing tends to become lost in the flight missile systems.

3. This Directorate recognizes the value of the Air Force conducted tests by Air Force personnel in bringing to light problems that do not occur under controlled conditions at contractor facilities, however, they should be recognized as being in the operation test area and not as true reliability testing. Further, they should be considered with this idea in mind.

4. With regard to the reliability testing of the Bell 8096 engine, a program of 30 (8096) duration runs plus 50 start - stop runs is being negotiated by BMD. Estimated costs are as follows:

Test	1.4	
Equipment	.5	
Propellants	.8	(engines & spares not included)
Instrumentation	.4	
Design, Research & Reports	.2	
	3.3	

It is recognized that this program is too ambitious and that the number of runs must be revised downward, however, the figures will serve for a rough comparison. Information from AFFTC indicates that the rocket

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laboratory will finish tests on the Thor engine, 1 July 60. At that time personnel will be free for any additional work. If given a go ahead by 1 May 60, the first engine can be tested by 1 Oct 60. All testing can be completed in two months, an additional month will be required to complete the final report. A cost breakdown for this program follows:

Propellants	.5 million	
Equipment	.3	(Engines, spares, AF overhead, not included)
Instrumentation	.05	
Blockhouse console	.05	
Bell Tech representatives	.05	
Data reduction, reports, etc.	.2	
	1.15	

Other considerations involved besides cost should be examined. First, the feed back of the reliability tests, if performed at EAFB, even with Bell representation will not be as satisfactory as tests conducted by Bell at their home plant. Second, the problem of timing is not completely resolved at this time. Originally, it appeared that Bell would be in a position to start testing before Edwards would be ready to commence. However, certain minor changes to the engine should be completed before testing. These changes will delay Bell so that with a go ahead given now to Edwards, either could commence testing when the engine is ready. It can reasonably be assumed that Bell, due to their familiarity with the engine, could complete the tests 30 - 60 days in advance of Edwards. It is desirable that the tests be completed as soon as possible, however, the effects of the difference of 30 - 60 days at this time cannot be measured. Third, the problem of "keeping Bell alive" should be considered although this problem is not as pressing with the increased Discoverer program and the NASA Agena B program. LMSD has estimated that a savings of less than 1 million dollars between the two test locations should not be a deciding factor in placing the program. As the program is reduced in scope, this difference will fall near the 1 million mark.

5. This Directorate, based on the above, recommends a reliability test at Bell. This test to be reduced in scope from the rough figures presented. A limited test at Edwards is desirable for the information gained by tests conducted by Air Force personnel and for providing a nucleus of AF trained personnel, however, these tests should be weighed against additional costs to the program and should be decided by the responsible program office.

6. Inertial components used in the Agena program are the Reeves HIG-4 gyros, [illegible] accelerometer, Minneapolis-Honeywell HIG-4 gyros, Bell velocity-meters, and Kearfott control [illegible] gyros ([illegible]). Of these components, [illegible]

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out of production or do not require a mean time to failure that would warrant such a reliability program.

7. The Kearfott control moment gyros are presently scheduled by LMSD to be life tested by Kearfott at the following estimated cost:

10 gyros at 6000 each	-	$60,000
Life test and manpower	-	63,000
		$123,000

No similar LMSD estimate is available for the M-H Hig-4 gyros, however, using the figures for the Kearfott gyro representative, estimated costs are as follows:

4 M-H Hig-4 gyros at 3000 each		$12,000
Life tests and manpower	-	25,200
		$37,200

8. A similar estimate made by Major Savage of the Holloman Central Inertial Test Facility is as follows:

10 Kearfott control moment gyro at $6000 each	-	$60,000
No manpower charge		-
Test equipment & life test $4300/gyro		43,000
		$103,000
M-H Hig-4 gyros at 3000 each		$12,000
No manpower charge		-
Test equipment & life test $4300/gyro		17,200
		$29,200

9. The test facility at Holloman is admittedly in the embryo stage. Only one "D" gyro test table and electronics are presently on hand and installed. Three more are due to be delivered in July, however, installation and check out will take at least three months. Personnel are in a training status and engineers from AC Spark Plug are assisting in this training. Data produced would not, in all probability, be as reliable or as timely as that provided by a well trained and well equipped organization.

10. In view of the importance of these projects and the importance of proving the long mean time to failure required of the Kearfott gyro, it is not recommended that the Holloman facility be used at this time.

11. Once this facility becomes equipped, manned and trained, a second look should be made as to its utilization.

SIGNED

WDZN 398

OFFICE SYMBOL	[illegible]	WDZJR	[illegible]	WDZVS
NAME (SIGNATURE)	[illegible] Colonel, USAF Director, [illegible]		WDZNP	
DATE				4 Apr 60

AFBMD Form 11 COORDINATION SHEET Replaces AFBMD Form 11, 1 Jun 59

~~CONFIDENTIAL~~

enclosures [illegible] detached)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GODDARD SPACE FLIGHT CENTER
[illegible]
[illegible]
ANACOSTIA NAVAL STATION
WASHINGTON 25, D. C.

IN REPLY REFER TO:
4930/CVA/alf

March 23, 1960

Agena B
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Rangerfile

-592 contract all on contract

Commander
Air Research & Development Command
Andrews Air Force Base
Washington 25, D. C.

Attention: Code RDGN

Subject : NASA Order No. S-4601-G

Dear Sir:

Funds in the amount of $1,100,000.00 are hereby made available for use by ARDC for initial procurement from Lockheed Missiles and Space Division, Sunnyvale, California, of engineering services and long lead time hardware items for Agena-B Vehicle Program in accordance with Enclosure (1), Statement of Task, Enclosure (2), NASA Agena Launch Schedule; and Enclosure (3), Statement concerning Patent Rights.

These funds are chargeable to Appropriation 80X0108, GSFC (Agena) R&D, FY 1960, Vehicle Procurement.

It is requested that this office be furnished a copy of any contract awarded as a result of this order.

NASA Order No. S-4601-G has been assigned for identification purposes.

It is requested that you acknowledge receipt of this order by signing and returning the attached copy of this letter.

Contracting Officer

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pendix A to Historical Report
1 Apr - 31 Dec 61

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Ranger file

SSVR 0132

Statement of Task

Purpose of assignment of funds is to initiate AFBMD/BMC procurement by Letter Contract from Lockheed Missiles and Space Division, Sunnyvale, California. Funds allocated ($1.1 Million) will provide initial increment of funding toward this contract. It is intended to definitize this Letter Contract and provide additional funding within approximately two (2) months from initial date of contract.

The following work scopes and levels of effort are applicable to the interim contract arrangements:

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a. Provide facilities and personnel as required to perform, on a task assignment basis, engineering services of the following general categories:

(1) Physical parameter studies
(2) Trajectory calculations
(3) Performance studies
(4) Engineering liaison

The level of effort should be that which can be accomplished within an expenditure ceiling of $250,000. Expenditures by the contractor against the established level of effort are to be assigned through issuance of individual task directives. These task directives will contain the scope of work desired, time of performance and estimated expenditure for each directive. The contractual documents should provide that task directives will be originated and issued solely by the NASA representative at AFBMD, so long as such work does not exceed the contractors authorized level of effort.

b. Procure "long lead time" hardware to insure compliance with the attached NASA Agena-B launch schedule. The contractor will be responsible for determining criticality and priorities in selection of "long lead time" items within the authorized levels of expenditure. Interim contract should be limited to $850,000 for initial procurements in the following areas:

(1) Basic Agena-B vehicles
(2) Ground support equipment

c. Contractor will establish program control procedures and publish technical, planning, and fiscal reports at monthly intervals commencing one (1) month after date of contract award. Program controls will permit identification by [illegible] by task assignment [illegible]

0531

Lockheed Missiles and Space Division, Sunnyvale, California, is considered sole source for this procurement because of their previous R&D effort and production of similar items under USAF procurement. Since these items could not be obtained from other sources and meet the planned delivery schedules, procurement from requested source is considered within the best interests of the Government.

733

CO-0534

Enclosure (1)

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NASA Agena Launch Schedule

APRIL 25	61	LUNAR	→ A-Ag	AMR
JULY 25	61	LUNAR	→ A-Ag	AMR
~~OCTOBER~~	~~61~~	LUNAR	→ A-Ag	AMR
NOVEMBER	61	NIMBUS	T-Ag	PMR
JANUARY	62	LUNAR	→ A-Ag	AMR
FEBRUARY	62	POLAR GEOPHYSICAL	T-Ag	PMR
APRIL	62	LUNAR	→ A-Ag	AMR
MAY	62	NIMBUS	T-Ag	PMR
JULY	62	METEOROLOGY	T-Ag	PMR
AUGUST	62	COMMUNICATIONS SATELLITE	→ A-Ag	PMR
SEPTEMBER	62	SOLAR GEOPHYSICAL	T-Ag	AMR
NOVEMBER	62	GEOPHYSICAL OBSERVATORY	→ A-Ag	PMR
JANUARY	63	METEOROLOGY	T-Ag	PMR
FEBRUARY	63	ASTRONOMICAL OBSERVATORY	→ A-Ag	AMR
APRIL	63	SCIENTIFIC	T-Ag	PMR
JUNE	63	SCIENTIFIC	T-Ag	PMR

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72

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDZT-1/Runge/3049

SUBJECT: Agena Vehicle Captive Test Program

APR 11 1960

TO:
WDZY WDZH
WDZYD LMZJ
WDZYH
WDZYE

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1. The present scope and status of the Agena Vehicle Captive Test Program are the result of many contributing factors, which date back as far as 1957 when the LMSD Santa Cruz Test Base was first conceived, in the light of a flight schedule which has long been forgotten. SCTB was originally designed for R&D vehicle, propulsion, and component testing. Acceptance firing of each vehicle was conceived after the facility was nearly completed and thus called for augmenting instrumentation and equipment. The Discoverer schedule imposed a much earlier load and higher rate on SCTB than originally planned, and when compounded with SAMOS and MIDAS requirements justified the recently incorporated dual stand-blockhouse c/o and control capability.

2. In view of an apparent stand overload, LMSD proposed (in August 1959) a new two-stand complex for SCTB to be funded entirely by AFBMD (facilities and equipment) except for LMSD leasing the property to AFBMD and extending existing roads and utilities to meet the new property line. A request to USAF Headquarters for such industrial facility funds resulted in direction to survey all existing and available test stands before considering new ones. LMSD, WDZT and LMZJ investigated and surveyed the Douglas/Sacramento and Edwards AFB Stands, and performed cost studies for Agena operations at such locations. Subsequent to these actions, LMSD surprisingly stated that a closer look at schedules indicated that actually no requirement existed for new stand facilities, since the efficiency of SCTB was increasing to the point where existing programs could be accommodated; Acceptance and FTVA testing only, that is.

3. WDZT, WDZH and LMZJ have for some time attempted to determine what overall Vehicle Testing Philosophy LMSD employs. It is felt that the variations in funding and scheduling, and the significant costs of test facilities have caused LMSD to generally shy away from proposing a realistic Vehicle Captive Test Program.

4. Our Space System Test Philosophy and Reliability Programs stress great concentration on lower-cost ground-type testing prior to embarking on high-cost testing on a system scale. It does appear that the tremendous and accelerated development of the Agena vehicle involves only a limited amount of vehicle captive testing, in spite of the high cost of system tests, and failures.

5. The requirements for Agena vehicles are increasing, and in every Agena program greater assurance of vehicle reliability is vitally needed.

6. In view of the situation described above, it is requested that you attend a meeting aimed at developing an Agena Captive Test Plan in accordance with present and future Program requirements, System-Type Test objectives and Reliability requirements.

Meeting Data: DATE 13 APRIL TIME: 1330 PLACE: Bldg. 2 Rm. [illegible]

SIGNED

NELSON L. BOMBA
Lt Colonel, USAF
Director
Space Test and Activation

DAILY BULLETIN

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
AIR FORCE UNIT POST OFFICE, L.A. 45, CALIF.

ALL MILITARY AND CIVILIAN PERSONNEL IN THIS DIVISION WILL BE HELD RESPONSIBLE FOR COMPLIANCE WITH ALL ITEMS IN THE OFFICIAL SECTION

All notices must be submitted to the Office of Administrative Services prior to 1300 on the day preceding publication

DAILY BULLETIN 12 April 1960
NUMBER 71

OFFICIAL

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STAFF DUTY OFFICER (EXT. 2863)

1630	12 Apr 60 to 0830	13 Apr 60	Capt John N. Van Dusen
1630	13 Apr 60 to 0830	14 Apr 60	Major John C. Wertz
1630	14 Apr 60 to 0830	15 Apr 60	Major James J. McMahon, Jr.
1630	15 Apr 60 to 0830	16 Apr 60	Capt John R. Ford
0830	16 Apr 60 to 1630	16 Apr 60	Major Charles Cusworth
1630	16 Apr 60 to 0830	17 Apr 60	Major Frank W. Tester
0830	17 Apr 60 to 1630	17 Apr 60	CWO, W4 George W. Kridner
1630	17 Apr 60 to 0830	18 Apr 60	Capt Frank H. King
1630	18 Apr 60 to 0830	19 Apr 60	Capt John C. Ashmead
1630	19 Apr 60 to 0830	20 Apr 60	Capt William M. Patton

Duty Data - Report in uniform at 1600 to the Office of Administrative Services, Room 327, Bldg 12, for briefing.

Agena

1. AFBMD NASA/AGENA "B" PROGRAM DIRECTORATE (WDZJA): Reference is made to Daily Bulletin Nr 61, paragraph 2, page 2, dated 29 Mar 60, Subject: NASA AGENA LAUNCH VEHICLE PROJECT: Effective immediately, the AFBMD NASA/AGENA "B" Directorate is established under the Deputy Commander for Space Programs. The acting Director is Major John G. Albert. All inputs to the subject Program and its contractors will be made by and through the AFBMD NASA/Agena Program Directorate (WDZJA), Room 514, Bldg 5, Ext. 1274. (WDZ, Col Hoffman, Ext. 2292)

2. TRANSMITTING CLASSIFIED MATERIAL TO STL: There has recently been some confusion evidenced whether a receipt is required when classified material is transmitted or transferred to STL. The policy is:

> A receipt is required for all classified material transmitted or transferred to STL. This receipt must be an AF Form 310 (reference paragraph 8, AFR 11-14 and paragraph 8e, AFR 205-9).

(WDIPS, Capt Cohen, Ext. 634)

TAKE ME HOME

74

14 Apr '60

NASA AGENA B PROGRAM

MSFC AND AFBMD MANAGEMENT RELATIONSHIPS

1. PURPOSE

To establish basic responsibilities and define the management arrangements and procedures to be applied by Marshall Space Flight Center (MSFC) and Air Force Ballistic Missile Division (AFBMD) in the conduct of the National Aeronautics and Space Administration (NASA) Agena B Program.

2. RESPONSIBILITIES

a. MSFC, and specifically the MSFC Agena B Project Director, has been delegated the responsibility and authority for planning and execution of the Agena B vehicle program in support of NASA lunar and satellite missions.

b. Jet Propulsion Laboratory (JPL) and Goddard Space Flight Center (Goddard) are responsible for providing vehicle compatible spacecraft as required to satisfy specified NASA lunar and satellite missions.

c. NASA has assigned responsibility and authority for the overall accomplishment of the NASA Agena B vehicle program to AFBMD/BMC subject to review and direction by the MSFC Agena B Project Director.

3. PROCEDURES

The following actions, arrangements, and/or procedures are to be applied in the proper discharge of the above-stated responsibilities.

a. AFBMD will provide and do all things incident to provision of standard Air Force Atlas, Thor, Agena B boosters, and associated standard GSE (included in each case all standard Air Force improvements applicable and desired by NASA). Provide personnel, facilities, procedures and all other things required for field and launch operations including tracking and data acquisition to spacecraft injection in accordance with the agreed upon schedules established jointly by NASA and the Air Force.

b. NASA peculiar modifications (including design, engineering, and fabrication incident thereto), test programs, and/or other procurements over and above standard equipment as required will be directed by the NASA representative at AFBMD and implemented through AFBMD/BMC.

c. Engineering studies, test model fabrication, test and/or evaluations as may be required to support vehicle and spacecraft design and integration efforts will be directed by the NASA representative at AFBMD and implemented through AFBMD/BMC.

d. During launch operations AFBMD will perform the function of test controller and be responsible to the NASA launch director who will have final responsibility for accomplishment of NASA test objectives.

e. In accomplishment of this program AFBMD will furnish available and applicable information from Air Force Agena B Programs (consistent with information release authority) as may be required to support the NASA Agena B Program.

f. For implementation of this program AFBMD has established a Directorate under the Deputy Commander, Space Programs (WDZ) and MSFC has located representatives at AFBMD.

AIR FORCE BALLISTIC MISSILE DIVISION
HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDLPM-4

SUBJECT: AGENA Program Progress Report as of 30 April 1960

6 May 1960

Agena

TO: Director
Advanced Research Projects Agency
Washington 25, DC

1. This report, covering progress during April 1960, is submitted in accordance with ARPA Order No. 96, dated 1 July 1959 (Project Code No. 3600). Order No. 96 directs the modification of the AGENA upper stage vehicle to obtain single restart capability and increased propellant capacity.

2. TECHNICAL STATUS

a. Formal review of the PFRT results of the XLR 81-Ba-7 developed to provide an extended burn and single restart capability has been completed. This review revealed nothing of a nature requiring further development effort in light of the programmed usage of this engine.

b. Only four flight engines of this model will be used in the AGENA vehicle configurations.

c. While thrust chamber cooling for this model has proved to be critical during continuous 240 seconds firing time under certain conditions of coolant ambient temperature and IRFNA solids content, it has been determined that satisfactory chamber cooling can be assured by control of oxidizer solids content and ambient temperature. In view of this and the fact that only four engines of this model are to be used in AGENA vehicles further development effort has been stopped.

d. Since no further development effort will be conducted on this model of the AGENA engine and all development effort on the double capacity integral propellant tanks has been completed successfully, the modification of the AGENA upper stage directed by ARPA Order No. 96 is considered to be completed. This is the final report.

R L Curtin for

O. J. RITLAND
Major General, USAF
Commander

Copies to:
See attached Distribution

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

WDLPM-4-206

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

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HEADQUARTERS
AMC BALLISTIC MISSILES CENTER
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

REPLY TO ATTN OF: [illegible]/2095 12 May 1960

SUBJECT: [illegible] of Thor Vehicles to the NASA Agena B Program

TO: [illegible]
ATTN: Lt Col W. G. [illegible]

1. Headquarters USAF teletype AFC [illegible] dated 27 April 1960 to [illegible], transmitted in early [illegible] teletype [illegible], informed [illegible] that eight (8) Thor Boosters were to be allocated to subject program.

2. At a meeting held at the Inglewood Complex on 5 May 1960, attended by Captain [illegible] of [illegible], Mr. [illegible] and Mr. [illegible] of [illegible] and Mr. Williamson of [illegible], it was determined that the following Thor Boosters were to be assigned to subject program.

[illegible] Serials 309, [illegible], 311, [illegible], [illegible], [illegible], 337 and [illegible]

3. Determining factors for the selection of the above vehicles were [illegible] dates under present NASA programs as well as requirements of other programs. Some vehicles selected will be modified boosters authorized by Contract AF 04(647)-[illegible] and others will be early [illegible] boosters authorized by the same contract.

4. Captain [illegible] is to verify the configuration of Agena B boosters to the present DM-21 configuration.

[illegible] [illegible], JR.
Major, USAF
Chief, Special Projects Division

Cys to: WDZJ[illegible] (Captain [illegible])
[illegible] ([illegible])
AFSC ([illegible] [illegible])

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

RAD-5

WDZJ 61-2-8

~~CONFIDENTIAL~~

~~SECRET~~ ~~CONFIDENTIAL~~ 91

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO ATTN OF: WDGP/Lt Col Snyder/2706

SUBJECT: General Schriever's Appearance Before Johnson Committee, 9 June 1960.

2 June 1960

TO: Hq ARDC (RDGP)
Attn: Col R. K. Jacobson
Andrews AFB
Wash 25, DC

1. Although unrelated to the Amendments to the National Space Act, the following two subjects may come up during General Schriever's appearance before the Johnson Committee 9 June 1960:

a. ABLE-5 Venus probe, January 1961

b. GAO Report regarding Air Force-NASA exchange of information relating to the Agena B.

2. Col Appold is completely up-to-date on the Venus probe status, and should provide Gen Schriever a current resume in view of Mr. Belieu's acquaintance with the subject.

3. It is my understanding that the Johnson Committee has been furnished the GAO Report concerning the Vega and Agena B. Apparently this report alleges NASA waste of some $16 million on Vega due to Air Force failure to provide NASA with technical information regarding Agena B. The report is based at least in part upon the visit to AFBMD by Mr. Hamm of the GAO during the period approximately 7-11 March 1960. Mr. Hamm looked into a number of aspects of various NASA programs in which the AFBMD has participated, and asked a number of questions regarding Vega and Agena B (see attached reports of contact). To the best recollection of those AFBMD officers interviewed by Mr. Hamm, he asked few questions specifically relating to the exchange of technical information, nor was there any indication that this was a point of concern to him. He did, however, ask questions regarding the earliest documentation by which AFBMD informed NASA of delivery schedule availability of Agena B vehicles.

4. The attached reports of contacts and memoranda of transmittal summarize the extent of information provided to Mr. Hamm. In addition, the following chronology summarizes other information which specifically relates to the subject of Agena B and Vega, but which was not in some cases queried by Mr. Hamm:

a. 4 Feb 59: Lockheed Missile Systems Division presented to ARPA and NASA its unsolicited proposal "The LMSD Liquid Propellant Propulsion Stage". This was unofficially understood as an LMSD effort to exceed the performance of the AJ 10-104. Formal reports of this material (Volumes I and II of LMSD - 48469) were forwarded to AFBMD by Lockheed on 2 March 1959.

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DECLASSIFIED AFTER 12 YEARS.
DOD DIR 5200.10

CONFIDENTIAL ~~SECRET~~

WDGP-60-16

~~SECRET~~

~~CONFIDENTIAL~~

b. 10 April 59 - Amendment 4, Task 3 of ARPA Order #17-59 was issued: to develop an Agena with increased tankage, restart engine, and simplified structure (dollars and technical requirements were exactly as stated in documents identified in subparagraph 4(a) above.

c. 9 June 59 - Directorate of Astro-Engineering (then WDZWS) advised other AFBMD offices of impending Agena modifications and requested revised performance requirements.

d. 19 June 59 - LMSD 445345 documented optimization studies on tank size for Atlas, Titan, and Thor boosters.

e. 15-19 August 59 - Capt John A. Fiebelkorn (AFBMD) visited JPL to verify Vega capability. Data assembled and taken forward by Major H. F. Wienberg (AFBMD) for presentation to General Schriever on or about 20 August 1959. This is the first known instance in which an Air Force technical office became aware of the duplicating capability of the Vega system.

f. 21 Aug 59 - AFBMD presentation to below-named individuals giving Agena methods of operation and development status:

Homer J. Stewart	- NASA
Donald F. Hornig	- NASA
Addison M. Rotrock	- NASA
Richard Swemberg	- NASA
William R. Sears	- NASA
Jesse L. Mitchell	- Staff to the Scientific Advisor to the President
George P. Sutton	- ARPA Chief Scientist

g. Presumably, at some time following the presentation to General Schriever, the General discussed the subject with Mr. Horner. The Vega program was cancelled by NASA on 11 December 1959, according to newspaper reports.

FOR THE COMMANDER:

Richard C Snyder

RICHARD C. SNYDER
Lt Colonel, USAF
Chief, Policy Office

Atch
Info submitted to GAO re Vega/Agena B

Copy to:
Maj Brower, OSAF (SAFLL)
(less atch)

~~CONFIDENTIAL~~

~~SECRET~~

78

WDZY-2/Maj Allred/2605

Improvement of Agena Flight Preparation Procedures

JAN 19 1960

Lockheed Missiles & Space Division
Post Office Box 504
Sunnyvale, California

1. This office has long considered the time span between Modification and Checkout and launch readiness of the Agena vehicles to be excessive. Much effort has been expended, both by this headquarters and LMSD in studies and evaluation in attempts to shorten the time between launches, as well as the flight preparation time. To date no significant reduction in this time has been achieved.

2. In doing a little soul searching, I wonder if we are using the right philosophy, methods and procedures to accomplish the Santa Cruz Test Base tests, Missile Assembly Building checkouts and launch pad tests for flight readiness.

3. Investigations have revealed that the Titan Program has a seemingly simpler concept. A combined systems test is performed as part of the Air Force acceptance and the vehicles are then placed in the test stands at Denver where a sequence compatibility firing is conducted. The vehicle is then shipped to the launch base where only acceptance inspection, installation of GFE is performed and the vehicle erected on the launch pad. The final step in preparation is to perform a dry run and flight readiness firing. Improper operation of any of the systems at the launch base results in the return of the entire vehicle to the Martin Plant at Denver for rework. Individual circumstances may warrant deviation from this philosophy.

4. It is requested that you investigate the procedures used by the Titan Program and attempt to significantly improve our own operation. You are authorized to contact the Martin Company at Denver and AFMTC for this purpose.

5. It is also requested that you keep me informed of your progress in this matter.

ALFRED H. ALLRED
Major, USAF
FREDERIC C. E. ODER
Colonel, USAF
Assistant Deputy Commander
Space Systems

WDZJA/Maj Albert/2292/lk/12 Jul

UNC

16 JUL 1960

Management Relations with the NASA Concerning the NASA
Agena B Program

ARDC (RDC)
Andrews AFB
Wash 25, D.C.

1. As stated in a memorandum to General Schriever from Colonel Evans, dated 23 Jun 1960, it is necessary that a policy definition of the USAF/NASA relations for implementation of the NASA Agena B Program be established at the earliest possible time. As a follow-on to the 21 Jun 1960 meeting held at Cape Canaveral, which resulted in disagreement concerning prelaunch and launch operation procedures, a meeting was held at Hq AFBMD on 1 Jul 1960 with representatives of this headquarters as well as representatives from 6555th Test Wing and the Vandenberg Field Office. This meeting established the Hq AFBMD position which is stated in the subsequent paragraphs.

2. The establishment of several fundamental points is necessary if the capabilities, experience, and facilities inherent with the Air Force for ATLAS, THOR, and AGENA operations are to be effectively utilized. These points are as follows:

a. It is necessary that the Air Force role or task in the NASA Agena B Program be adequately defined.

b. The Air Force must be assigned the authority and responsibility necessary to accomplish the assigned task.

c. In carrying out the assigned task, the Air Force must recognize the higher NASA mission authority.

3. At a meeting held on 1 Mar 1960, attended by General Ostrander, Colonel Appold and General Curtin, NASA requested that AFBMD capabilities concerning ATLAS, THOR and AGENA be utilized in the NASA Agena B Program. Mr. Horner's letter of 18 Mar 1960 to you confirmed NASA's intention to implement the NASA Agena B Program with the Air Force. As a result of these actions a proposed management agreement was prepared by representatives of NASA, copy attached. This agreement was furnished Colonel Appold's office by General Curtin on 31 Mar 1960. On 14 Apr 1960, this agreement was further refined and concurred in by AFBMD, MSFC, and Lt Comdr Kelley, Agena B Program Manager, NASA Headquarters. This document was taken to NASA Headquarters by Comdr Kelley for General Ostrander's signature. During repeated queries as to the status, AFBMD was informed that the agreement was essentially satisfactory, however, would not be signed until NASA

Headquarters had finalized the establishment of the NASA Launch Operation Directorate. At the 21 Jul 1960 meeting at Cape Canaveral, it was obvious that the NASA Headquarters' intention concerning the AFBMD role was quite different from that indicated in the 14 Apr 1960 proposed agreement. As a result of the 1 Jul 1960 meeting at AFBMD, it is our position that it is imperative that this agreement be implemented if AFBMD is to effectively contribute to the NASA Agena B Program. If a lesser AFBMD role is assigned it is the opinion of this headquarters that the capabilities of the Air Force resources, which were provided to support USAF high priority military systems, would be seriously impaired. The advantages of assigning overall management responsibility for the NASA Agena B Program at AFBMD are as follows:

a. It is fundamentally unwise for a government contractor to receive direction from two sources on the same vehicle (Agena B).

b. The NASA Agena B Program must be made compatible with the Air Force Military Satellite System Programs not only as far as production capability is concerned but also because of the sharing of facilities which were specifically built to support the top national priority DISCOVERER, SAMOS, and MIDAS Programs (especially pertinent at VAFB).

c. The preparation and launch of space vehicles is a continuous operation that must be under the direction of a single operating agency.

d. It is impossible to conduct parallel operations of different programs which require the same facilities (such as the HAB Bldg. at VAFB) unless there is direction and control by a single agency. If NASA does not accept this central control, it is questionable as to whether or not the current NASA schedule for the Agena B Program can be attained.

e. By duplicating or establishing a parallel organization to accomplish functions already under the direction of the Air Force, inefficiency would result with reduced reliability for each individual launch. In our experience, in order to achieve the greatest reliability we must use existing facilities and people and routines in a repetitive fashion.

4. AFBMD is involved with the implementation of the program according to the proposed agreement and the program is progressing according to established milestones and program schedules. It is requested that action be taken with NASA assigning the overall responsibility and authority for accomplishment of the NASA Agena B vehicle program to AFBMD. The inclosed letter to NASA is a start.

SIGNED

O. J. RITLAND
MAJOR GENERAL, USAF
COMMANDER

2 Atch.
1. Agreement, 14 Apr 60 see under date
2. ARDC/NASA ltr —?
Copies to:
Col Wignall, Patrick AFB
Col Cody, Vandenberg AFB

80

WDZJA/Maj Al

WDE

NASA Agena B

16 JUL 1960

ARDC (RDZS), , D.C.

Maj General
Director, Lau
National Aero ministration
Washington 25,

IN TURN

1. For the p his organization has been carrying out
assigned resp ccomplishment of the NASA Agena B Pro-
gram. These discussed among Gen. Ostrander, Gen.
Coupland and on 1 Mar 1960. To further clarify the
items discuss ing, representatives of Marshall Space
Flight Center pared a management agreement on 28 Mar
1960. This refined on 14 Apr 1960, copy attached,
and at that t Mr. Hueter, MSFC; Lt Comdr Halley, NASA
Hq; and Gen. ate there has been no formal approval of
this document AFBMD has been verbally informed that
there are oth clarified, particularly in the area of
launch operat a copy of the mid-May MSFC position con-
cerning the perations for the Agena B Program and
concurs with sponsibilities outlined. To date AFBMD
has been ope the 14 Apr 1960 agreement.

2. The work Force contract with Lockheed Missile
and Space Div NASA Agena B Program has been written
with NASA org Propulsion Laboratory (JPL), Goddard
Space Flight and contributing. This contract pro-
vides for Lo ntegrator, accomplish design and engineer-
ing, provide and shroud (less spacecraft package),
conduct Agena d furnish final reports. AFBMD is also
provisioning d THOR boosters, accomplishing modifica-
tion and act t AMR, providing the Test Controller
during launc ing the spacecraft through injection.
It has been D/BMC to accomplish this task for NASA
in a manner ce Satellite Systems. AFBMD has built
up a broad c ATLAS, THOR, and AGENA, therefore, we
consider it onal interests if these capabilities
were utilized A Agena B Program. AFBMD fully realizes
that this pro nted and intends to accomplish its assigned
role on this

3. It has recently become evident that the AFBMD role in the NASA Agena B Program is either quite undefined by NASA Hq or not understood by the various organizations involved. At a 21 Jun 1960 meeting at AMR attended by representatives of NASA Hq, MSFC, Launch Operations Directorate (LOD) and AFBMD, a proposed revised and more inclusive management agreement was read to the group. Although NASA declined to furnish AFBMD a copy of this proposed document for Gen. Ostrander's signature, the overall impression was that this document failed to properly define the AFBMD task or responsibility but rather stated numerous exceptions to be employed while utilizing the AFBMD capability. In our opinion the proposed Launch Operations Procedures document which was thoroughly discussed at the 21 Jun 1960 meeting at AMR has provisions which deny AFBMD the authority to properly utilize an existing inherent capability concerning THOR, ATLAS and Agena B launch operations. As an example, this agreement calls for parallel responsibilities or a change in primary responsibility during the prelaunch and launch phase. This procedure would certainly reduce overall system reliability.

4. During both working group and technical panel meetings attended by AFBMD, it has become apparent that either all NASA organizations involved with the NASA Agena B Program, (especially individual representatives) do not understand the role assigned to AFBMD on this program or AFBMD is operating under a misconception pertaining to our authority and responsibility. On several occasions it has been stated that AFBMD has been exercising an undue influence on this program. With this feeling the effectiveness of AFBMD is being impaired. It should be stated, however, that the management and working relationships between MSFC and AFBMD have been proceeding satisfactorily, even though the overall environment has not been clear.

5. The AFBMD staff has recently reviewed its role in this program and considers the 14 Apr 1960 proposed agreement to be adequate in defining the assigned task as it is understood by this headquarters. It is requested that AFBMD be informed as to the status of the 14 Apr 1960 management agreement.

6. In summary, it is requested that the AFBMD role in this program be [illegible] gated for its accomplishment. AFBMD will recognize and be responsive to the higher NASA authority in keeping with the mission objectives of the program. It can be stated that program progress is being hampered because of the existing uncertainty of organizational status, policies and procedures.

SIGNED

O. J. RITLAND
MAJOR GENERAL, USAF

1 Atch
Management Agreement

Copies to:
[illegible]

Col. Cody, Vandenberg AFB

3

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AFBMD VANDENBERG FIELD OFFICE
Hq AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
United States Air Force
Vandenberg Air Force Base, California

REPLY TO
ATTN OF: WDG-16

SUBJECT: Agena Checkout Philosophy

9 SEP 1960

TO: WDZD (Col Evans)

1. The AFBMD Field Office has reviewed the tentative proposals to send the Agena satellite vehicle directly to the launch pad from the systems checkout at LMSD, Sunnyvale.

2. The position of this office is that the satellite vehicle comes from the final dynamic systems checkout area in a pad ready condition, not in a flight ready condition. This is true whether the final systems run is in the VAFB MAB or at Sunnyvale.

3. This office has been assigned the responsibility for verifying the R&D flight test readiness of the missile systems, launch complex, and support systems. In view of this responsibility, the verification checks performed in connection with the missile, launch, and support systems are a dual responsibility of the Air Force contractor and the AFBMD Field Office personnel exercising technical test control of the launch phase of the test. These verification checks are actually a check by the contractor of the system to prove that the system will meet predetermined and agreed upon engineering parameters. The verification acceptance responsibility by the AFBMD Field Office is actually exercised by checking that the meeting of the engineering parameters is shown by direct and conclusive proof rather than by indirect or theoretical extrapolation.

4. In this respect, the AFBMD Field Office Technical Test Control responsibility consists of reviewing test procedures to assure thoroughness of the test and to insure that checking is of the "end item" wherever possible. Thus this office will continue to review and approve test procedures, request changes, coordinate range/contractor operational sequences, and require verification demonstration of the systems in a launch ready mode. End-to-end checks that, experience has shown, are necessary to demonstrate a launch ready condition will be added to the launch area checkout procedures.

5. It is recognized that present proposals do not plan to eliminate end-to-end checks in the Sunnyvale systems run. However, experience has shown that many pad system runs have not proven satisfactory even after a successful run has recently been performed in the MAB. Recognition of such pad problems has almost always led to changes in the operational procedure and a requirement for a change in the technical response to a test in order to assure a quality system. Therefore,

WDG-16, Agena Checkout Philosophy

to assure your office of the greatest possibility for a high quality flight test, it may be necessary to repeat, add to, or change the end-to-end checks at the pad. Though it is often difficult to technically justify such processes, they are based on past vehicle/complex history, missile test experience, and the best judgment by AFBMD Field Office test personnel.

6. This office concurs with the desirability of sending the Agena directly to the launch pad. However, this change in philosophy makes it mandatory that no field modifications be accomplished by the contractor and that a complete checkout history be established by continuing the VAFB MAB system run until proof is conclusive that the VAFB MAB system run is a redundant check.

JOSEPH J. CODY, JR.
Colonel, USAF
Chief

Copies to: WDZYM (L/Col Riepe)
WDZYS (Col King)
WDZYD (Col Battle)

82

WDRA 19 SEP 1960

Agena Checkout Philosophy

WDG-16 (Col Cody)

1. This office recognizes your responsibility for verifying R&D flight test readiness, and considers it an essential part of the launch process. As you know the "factory to pad" concept is the final phase of the test philosophy. Before this goal is reached LMSD must provide vehicles that are similar to the first of a series vehicle tested at Santa Cruz Test Base. Further, there must be no modifications once the final systems run is completed at Sunnyvale and the final systems run conducted must be successful. It will be many months before a complete changeover can be made. During the change-over when certain up-stream tests are eliminated and procedures changed we will rely heavily on the Field Office for assurance that the vehicle is truly flight ready.

2. Throughout this period of changing test philosophy AFBMD program and engineering personnel invite your comments on changes in test procedures both at VAFB and those at Sunnyvale which affect the Field Office. Recommendations for types of test equipment necessary at the pad as well as those equipments that prove to be unnecessary would be appreciated.

3. In conclusion it is agreed that MAB systems runs should be conducted until experience shows them to be unnecessary. In the past we have relied solely on these runs as final verification due to the many modifications accomplished at VAFB. This insurance is too valuable to be eliminated on the first vehicles processed under the new test philosophy. The results of your findings and recommendations during the MAB runs will be used as a guide in the elimination of this phase of flight readiness verification.

EDWARD F. BLUM
Lt Colonel, USAF
Chief, Agena Office

Cys to: WDRD
WDRM
WDRS
WDRV

FFICE SYMBOL	ORIGINATOR WDRA/L/C Smith	WDRD	WDRM	WDRS	
NAME (SIGNATURE)					
DATE	16 Sep 60				

AFBMD Form 11
1 Nov 59

COORDINATION SHEET

Replaces AFBMD Form 11, 1 Jun 59

RJD

83

~~SECRET~~

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

REPLY TO
ATTN OF: WDRGS

SUBJECT: Request for Study - Atlas-Agena's Launch from AMR

SEP ~~16~~ 19 1960

TO: ARDC (RDRB)
Andrews AFB
Wash 25 DC

1. Message RDRB-26-7-105 dated 26 July 60 directed that the AFBMD conduct a detailed study assisted by the AFMTC on the feasibility of launching Atlas-Agena B vehicles into polar and other orbits from the AMR launch pads during the period of the next calendar year and possibly beyond. The vehicle would contain photographic payloads or major subsystems of this payload.

2. This study has been completed in as much detail as practical without further definition of the mission and payload parameters. It has been determined that is is technically feasible to place an Agena B with an engine cut off weight of 4742 pounds into polar orbit. For an eastwardly launch, it is also technically feasible to place an Agena B with a cut off weight of 5000# into a maximum inclination orbit of 47.5 degrees. A number of technical problems exist that will require further study. These problems are discussed in the STL report in inclosure one.

3. A proposed trajectory for polar orbit together with other related range safety data was presented on 25 Aug 60 to AFMTC for their study. A significant range safety problem may exist for the Florida coast and the over-flight of Cuba and Panama. Comments in respect to range safety will be forwarded separately by AFMTC.

4. An investigation into launch pad availability at AMR indicates that a conflict may occur for SAMOS launches at AMR. Pad schedules are attached. Specific comments in relation to these schedules follows:

a. Pad 12 - Two SAMOS launches for the new E-6 recoverable program were previously scheduled for launch from this pad in September and December 1961, and is shown on the schedule. This pad should require only minor modification to support the Atlas Agena launches. The timing of these launches is extremely close. A re-evaluation will undoubtedly be made when the source selection activities for the E-6 contractor is completed in late October. In the event that slippages occur, scheduling conflicts with other programs will be a problem as shown on the schedule.

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WDRSS-409

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b. Pad 13 - Extensive modifications will be required to connect this pad to an Atlas D Agena B capability. In anticipation of this modification, one SAMOS launch has been programmed. Other launches are also programmed as shown on the schedule. This SAMOS launch schedule will also require re-evaluation after the E-6 contractor has been selected. Scheduling conflicts may become a problem in the event that slippages occur.

5. The desirability of conducting an AMR SAMOS operation has not been fully explored. Considerations will have to be given to overall programming including the new E-6 configuration, the objectives of an AMR launch, timing, cost and the availability of launch pads. This information should result from the E-6 SAMOS evaluations and presentations. Additional study efforts towards resolution of technical problems will be, unless directed otherwise, withheld until programming actions are completed.

/s/ Col H. L. Evans

2 Atch
1. Feasibility Study of Launch Agena B from AMR (S)
2. Atlas Std Utilization (S)

+ in historical files

~~SECRET~~

WDZ-711

84

HEADQUARTERS
AIR FORCE BALLISTIC MISSILE DIVISION (ARDC)
UNITED STATES AIR FORCE
Air Force Unit Post Office, Los Angeles 45, California

SEP 22 1960

REPLY TO ATTN OF: WDZY-1/Runge/3371

SUBJECT: Test Criteria

TO: WDZYD (Col Battle)

1. Reference WDZYD letter to WDZY-1 dated 6 July 1960, subject: Test Criteria at Vandenberg AFB. (Request for Investigation)

2. The attached letter, LMSD/368772, dated 8 September 1960, describes the developments toward standardizing Satellite Systems Test Procedures and Criteria, and covers the specific area of interest identified in your letter as referenced in paragraph 1 above.

3. Although the Contractor delayed the forwarding of the letter described in par. 2 above for several months, it has been determined that considerable effort has been focused on the subject since July of this year.

4. The entire area of Agena Test Philosophy, Procedures and Criteria is being managed in detail by LtCol Blum and the Agena Division, and now appears to be progressing toward significant improvement in the near future.

5. It was noted that your office, among others, received a copy of LtCol Blum's letter to LMSD, dated 12 September 1960, subject: Reorientation of Satellite Systems Programs Test Philosophy. The attached LMSD letter (368772) will serve to further augment your information as to progress to date on the subject.

SIGNED

EDWARD W. CUTLER
Lt Colonel, USAF
Chief, Space Systems
Management Surveillance Office

1 Atch
Ltr, LMSD/368772, a/s

Copies to: WDZYA
WDZYM
WDZJA

LOCKHEED AIRCRAFT CORPORATION
Missiles and Space Division - Sunnyvale, California

In reply refer to:
LMSD/368772
Dept. 62-40

8 September 1960

COPY

Subject: Standardization of Test Procedures and
Criteria - Developments Toward.

To:
AFBMD (WSRV)
Attn: Col. H.L. Evans
Air Force Unit Post Office
Los Angeles 45, California

AFBMD (LRMD)
Attn: Col. H.M. Fletcher
Air Force Unit Post Office
Los Angeles 45, California

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Reference: (A) AFBMD/LMSD Program Review Conference at LMSD
Sunnyvale, 23 August 1960.

Enclosure: (a) LMSD/368772 - Summary of Developments Toward Standardization of Test Procedures and Criteria (Unclassified), dated 8 September 1960.

1. This letter responds to the request made to LMSD during the referenced conference for interim information on our efforts toward more systematic testing. This matter is an action item on the monthly AFBMD/LMSD Program Review agenda.

2. The scope of LMSD activity in this matter covers the following categories, brief descriptions of which are provided by enclosure (a):

a. Vehicle Test Plan
b. Vehicle Test Specifications
c. Test Procedures
d. Design Change Provisions

3. LMSD procedural improvement activity on system testing is intended to insure maximum utilization of test equipment through bypass of SCTB for some vehicles and reduction of repetitive testing at any test center. The gross objective is to decrease the costly period from manufacturing to launch for each vehicle.

LOCKHEED AIRCRAFT CORPORATION
MISSILES AND SPACE DIVISION

/s/ F. W. O'Green

D. J. Gribbon, Manager
Satellite Systems

DJG:WRA:JWF:rbc

sure (a) LMSD/368772

SUMMARY OF DEVELOPMENTS TOWARD STANDARDIZATION
OF
TEST PROCEDURES AND CRITERIA

I. Vehicle Test Plan.

A Vehicle Test Plan will be prepared for each vehicle and will define the scope and type of testing required. It will prescribe organizational responsibilities and set forth a sequence of activities corresponding to the established vehicle schedules. The Plan will be identified by a seven digit drawing number called out on the "Vehicle Assembly Complete" drawing.

Activation – The Vehicle Test Plan procedure will be effective beginning with Vehicles 6205-1106, 4205-2102, 7205-1201, and 10205-6001 in each Program series.

Scope – The Vehicle Test Plan for each vehicle will cover Vehicle System Test (SV), ECTB and Launch Base operations, as applicable.

Release – Each Plan will be released eighty work days prior to the scheduled start of a given vehicle through Vehicle Systems Test operations. Vehicle Test Plans for any of the above or subsequent vehicles which are already past their release dates are to be released by 30 September 1962.

Responsibility – Reliability and Test Engineering, 61-20, will be responsible for issuing each Plan.

II. Vehicle Test Specifications.

Vehicle Test Specifications will include:

(a) General information (test objectives, precautions, special requirements, etc)

(b) Critical operating limits.

(c) Test operations based on prelaunch, ascent and orbital functions.

(d) Gyro torquing plan.

(e) Index of applicable subsystem and system test procedures.

(f) Acceptance criteria.

A specification is to be prepared for each vehicle and will be identified by a seven digit drawing number called out on the "Vehicle Assembly Complete" drawing. Supporting documents (e.g., preliminary ascent, orbital and command sequence drawings; wire diagrams, schematics; subsystem Acceptance Test Specifications) shall also be called out in the drawing structure.

Activation – Same vehicle effectivity as that for the Vehicle Test Plan above except that the first Discoverer vehicle affected will be 6205-1103.

Scope – Same as that for the Vehicle Test Plan.

Release –

	No. work days prior to start of Veh. Syst. Test (per given Veh.)	Date for Specs on applicable Vehs. (above) which are now overdue.
Preliminary Veh. Test Specs.	100	9-30-60
Formal Veh. Test Specs.	40	9-10-60
Supporting documents.	60	9-10-60

Indices of Applicable Subsystem and System Test Procedures corresponding to Test Specifications already released will be issued by 30 September 1960.

Responsibility – Reliability and Test Engineering, 61-20.

Test Procedures.

Standardization of test procedures permits more valid comparisons of test results and helps preclude unnecessary duplication of tests. The following programs to insure standardized test procedures have been implemented for the Discoverer Program and for the SAMOS, MIDAS, and NASA Programs.

Discoverer.

Activation – A special task force has been established to derive a standard set of test procedures. The team is authorized to secure all technical assistance necessary to accomplish the standardization without delay, in particular, without the need for additional approvals. Their first task is to review all system and subsystem procedures currently existent for vehicles 1103 and subsequent. From this review they will be able to assemble already written procedures into a single standardized Discoverer procedure.

Scope – Same as that for the Vehicle Test Plan.

Release - All procedures for vehicles 1103 and subsequent:

One-third complete	-	9 Sept. 1960
Two-thirds complete	-	30 Sept. 1960
Complete	-	28 Oct. 1960

Responsibility - The task force is headed by a member of Systems Integration (62-40) and has a membership of representatives from VAFB Engineering (61-71), Santa Cruz Test (62-57), Vehicle Systems Test (62-52), and Test Engineering.

It is also the specified responsibility of this task force to institute action for any equipment modification which may be required to serve standardized testing.

SAMOS, MIDAS AND NASA.

Activation - Effectivity is the same as that for the Vehicle Test Plans for these Programs. Vehicle Systems Test, 62-70, will prepare or compile drafts of all test procedures applicable to and required for the affected vehicles and will transmit these procedures to the SCTB and/or Launch Base for review. The procedures, including any resultant recommendations for changes or additions, will next be relayed to Systems Integration, 62-40, for review.

Scope - Same as that for the Vehicle Test Plans.

Release - Schedule for commencing transmittal of procedures for SCTB and Launch Base review:

Vehicle	2102	-	15 Sept. 1960
"	1201	-	15 Oct. 1960
"	6001	-	15 Nov. 1960

SCTB and the Launch Base personnel will review and transmit the test procedures with recommendations in writing to Systems Integration within two weeks of their receipt from Vehicle Systems Test.

Responsibility -

Generation of all test procedure drafts, including selection of applicable existent Procedures.

Vehicle Systems Test

Review and recommendations for changes and completeness - SCTB and the Launch Base.

Preparation and issuance of final procedures
- Vehicle Systems Test

Review of drafts and approval of final procedures
- Systems Integration

IV. Design Change Provisions.

The standardization achieved for all test procedures will be maintained in correspondence to design changes by strategic review of each Engineering Job Analysis (EJA) prior to its issuance for a change.

Activation - This practice became effective 1 September 1960.

Scope - Same as that for the Vehicle Test Plan.

Release - DCC will release EJA only if generating Subsystem has obtained its review by Vehicle Systems Test.

Responsibility -

Securing Review by Vehicle Systems Test
- Originating Subsystem/DCC

Maintenance of Test Procedure Standardization
- Vehicle Systems Test/Systems Integration.

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WDG 8 NOV 1960

NASA Agena B Schedule

WDZ

1. Dr. Glennan expressed concern during his 28 October 1960 visit at AFBMD over the possibility of NASA Agena B slipping. You are directed to set up a board of officers to include at least members from NASA, SAMOS Directorate, BMC, and Deputy Commander for Space Programs. This board will be required to make a survey of Agena production and delivery schedules to determine whether or not everything possible is being done to assure that the NASA Agena B schedule can be met.

2. I would like the board to proceed with the investigation and report to me as soon as practical.

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Original Signed
O. J. RITLAND

O. J. RITLAND
MAJOR GENERAL, USAF
COMMANDER

WDZ-1/Col Hoffman/dd

7 Nov 60

File Agena
PRD 1-19
86

LBZJR

18 November 1960

Implementation of New Test Philosophy, DISCOVERER Program, Contract AF 04(647)-558

Lockheed Aircraft Corporation
Missiles & Space Division
ATTN: Mr. D. J. Gribbon
Sunnyvale, California

1. Reference is made to Contract Change Notification 18 to contract AF 04(647)-558, which directed the contractor to prepare and submit, for Air Force approval, a test procedure outlining a new test philosophy which would be implemented as approved. In compliance therewith the contractor forwarded a test plan and sample detail test procedures by letter LMSD/373501, dated 1 November 1960.

2. The contractor is hereby authorized to implement the new test philosophy as outlined in LMSD/373501 letter dated 1 November 1960 for DISCOVERER Vehicles up to and including contractor serial number 1110, except as noted below.

a. It is preferred that the systems run to be conducted on Agena Vehicle number 1110, subsequent to hot firing at SCTB, be performed at Sunnyvale rather than in the Missile Assembly Building at Vandenberg AFB. However, in the event such action creates a critical loading problem in the systems test area at Sunnyvale, upon the approval of the AFPR's Office, these tests may be conducted in the Missile Assembly Building at Vandenberg AFB.

3. The contractor's intentions concerning tests to be performed on Agena Vehicles 1111 and subsequent, is not fully understood. Additional information is required which will clarify and expand on the material submitted. Specifically, confusion exists over the contractor's differentiation between pre-launch 1111 through 1114 and subsystem and system run tests on the pad specified for Vehicles 1115 and subsequent (paragraphs 6.d, e, and f of LMSD/373501). Prior to approval of this phase of the new test philosophy, it will be necessary for the contractor to describe in general terms what, when, where and how tests are to be conducted after receipt of the vehicle at Vandenberg AFB. In addition, all requirements for additional equipment, including information concerning possible diversion of same from present assets must be made known to this Complex prior to approval of this phase of the test plan.

4. Agena Vehicle 1115 will be returned to Sunnyvale for the conduct of a systems run prior to shipment to the launch base.

ICE SYMBOL	LBZJR	WDZYD	LBZJR	LBZJP	WDZYA
ME (SIGNATURE)	Jakes	PHW	mf	[illegible]	[illegible]
DATE	18 Nov 60	18 Nov 60	18 NOV 60	18 Nov 60	18 Nov 60

AFBMD Form 11 COORDINATION SHEET Replaces AFBMD Form 11, 1 Jun 59

5. Prior to final design release, a design review meeting shall be held and the configuration agreed to by AFBMD as fulfilling DISCOVERER requirements for Vehicle 1115. LMSD shall document the design configuration as agreed to at the Design Review Meeting for subsequent configuration control.

6. The contractor shall be required to submit a plan for establishing and maintaining strict vehicle configuration (as requested in WDZY letter dated 13 July 1960, Subject: Agena Test Philosophy and Plan).

7. It is requested that the contractor advise this office of the requirement for and availability of facilities to perform engine flushing operations. As general policy, it is desired that flight vehicles not requiring a hot-firing at Santa Cruz Test Base have all work and tests performed either at Sunnyvale or at the launch base and thus minimize handling, and limit exposure to problems resulting from personnel actions. Likewise, vehicles for which known required modifications exist which will necessitate a systems run after completion of same should have such modifications completed prior to the conduct of a systems run and thereby minimize unnecessary duplications of testing. Deviations to this policy may be approved by AFBMD/EMC upon request supported by work area loading justification or special facility requirements.

8. Request that the information requested herein (paragraphs 3, 6, and 7) be furnished to this office not later than 28 November 1960.

SIGNED

PHILIP STEINER, Lt Colonel, USAF
Chief, Production & Programming
Satellites Division

Copies to:
AFPR LMSD
WDZYA
WDZXD

OFFICE SYMBOL	ORIGINATOR				
IE (SIGNATURE)					
DATE					

AFBMD Form 11
1 Nov 59

COORDINATION SHEET

Replaces AFBMD Form 11, 1 Jun 59

-558 SIA Folder 80
N-26

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Introduction

This report gives a brief history of the NASA Agena B Program for the period 1 Jul 1960 to 31 Dec 1960. The program has been divided into five areas and will be discussed as such; they are as follows:

- Contract and Funding
- Management
- Personnel
- Program Status
- Milestones

A Development Plan and Board of Inquiry Report are included as pertinent documents.

2 Atch.
1. (S) Board of Inquiry Report, WDZJA-54, 30 Nov 60, 1 cy 310 made
2. (C) Space System Development Plan, WDLPR-391, 12 Aug 60, 1 cy 310 made

In SAMSO historical files

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CLASSIFICATION OF THIS DOCUMENT
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UPON REMOVAL OF ENCLOSURES.

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WDZJA-61-2

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NASA Agena B Program

Contract and Funding

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On 30 Jun 1960 negotiations were proceeding to definitize the Air Force Letter Contract, AF 04(647)-592 with Lockheed Missiles and Space Division (LMSD). The following table summarizes funds available 31 Dec 1960:

NTF-4	$ 3,750,000
S-4601-G	1,100,000
S-4601-G (Amendment 1)	5,100,000
S-6401-G (Amendment 2)	820,000
S-4601-G (Amendment 3)	240,000
S-5233-G	1,000,000
S-5233-G (Amendment 1)	3,000,000
NAS 8-73	1,084,000
NAS 8-73 (Amendment 1)	2,750,000
H-9174	116,000
H-6708	3,070,000
TOTAL	$22,080,000

Because of redefinition of the scope of work, negotiations were interupted and on 12 Oct 1960 cost negotiations were reopened. These cost negotiations continued through October and on 31 Oct 1960 an Air Force counteroffer was made. After a series of offers and counteroffers LMSD and USAF agreed on a total cost of 41 million for the program through CY 62. Fee negotiations are still in progress.

The funding of the program had been initiated by NASA Order S-4601-G and subsequently funded by NASA Orders S-5233-G, NAS 8-73, H-6708, and H-9174. In addition, funds from NTF-4 were assigned to the program to apply as the initial increment of funds for procurement of Atlas boosters.

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[illegible] YEARS
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Management

As of 30 Jun 1960 negotiations were in process to obtain a management agreement between NASA and AFBMD.

On 1 Jul 1960 a meeting was held at AFBMD pertaining primarily to the launch operation procedures for the NASA Agena B Program. This meeting was attended by Col Wignall, 6555th Test Wing; Col Cody, Vandenberg AFB; Col Hoffman, WDZE, and other members of the AFBMD staff. At this meeting it was decided that the 14 Apr 1960 proposed management agreement was still valid in stating the AFBMD position. A proposed briefing to General Schriever on this matter was also reviewed. It was the unanimous opinion of the group that the following be accomplished:

1. The AFBMD role in the NASA Agena B Program be firmly defined.
2. AFBMD be assigned the authority and responsibility required to accomplish the defined task.
3. AFBMD would be responsive to the higher NASA authority concerning mission objectives.

On 16 Jul 1960 a letter was drafted for General Ritland's signature outlining the above three areas of concern.

The Development Plan for the NASA Agena B Program was published on 12 Aug 1960 and forwarded to Hq ARDC for submission to NASA. The Development Plan is presented as an attachment.

In answer to the proposed management agreement for the NASA Agena B Program, AFBMD sent a letter to General Ostrander, Director of Launch Vehicle Programs (NASA) on 25 Aug 1960.

To finalize an acceptable management agreement, a conference was held on 9 Sep 1960 in Washington DC. Agreement was reached on all management areas with the exception of launch operations. This area was to be worked out at a future meeting between General Ritland and General Ostrander.

As of 31 Dec 1960 the launch operations position has been resolved and the complete Management Agreement was being prepared for Dr Seamans, (NASA) and General Schriever. The Development Plan is also being reviewed and as of 31 Dec 1960 had not been formally approved by NASA.

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Personnel

On 30 Jun 1960 the NASA Agena B program office was composed of three officers: Maj John G. Albert, Chief, NASA Agena B Division; Capt Norbert J. Walecka, Project Officer; and 2ndLt Arthur W. Vogan, Project Officer. Since 30 Jun 1960 the following officers have been added to the program:

Maj Charles A. Wurster, 1 Aug 1960,
Assistant Chief of Division

1stLt Benny F. Johnson, 23 Jul 1960,
Project Officer

2ndLt Roger A. Mattson, 4 Nov 1960,
Project Officer

At present (31 Dec 1960) the NASA Agena B Division is composed of six officers. The Division is primarily concerned with the areas of Vehicle Integration, Launch Operations, and Spacecraft Support.

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Program Status

On 30 Jun 1960 the design of the Ranger Agena B booster was proceeding satisfactorily and the supporting GSE for checkout at Sunnyvale and launch operations was in the early planning state.

On 4 Aug 1960 word was received from Dr Hans Hueter, Marshall Space Flight Center (MSFC), NASA Agena B Program Director, that the NASA Agena B Program was to be redirected. The redirection involved reducing the total number of programed launches from sixteen to nine due to uncertainties in specifications for satellites to be launched in 1963 and 1964. Specifically this meant that the LMSD contract was shortened to extend through 1962 and support only those missions that were presently firm. It was decided that the existing cost proposal would have to be revised to support the new program, thus contract negotiations were suspended.

On 7 Sep 1960 the Development Plan for the NASA Agena B Program (see attachment) was published and sent to Hq ARDC for approval.

On 8 Sep 1960 a presentation was made to MSFC by AFBMD and LMSD regarding a change in the test philosophy for the Agena B booster. This presentation was acceptable to MSFC and action was taken to implement the recommended changes in the launch control and Santa Cruz Test Base (SCTB) areas.

On 21 Sep 1960 AFBMD was informed that the mockup of the shroud, adapter, and forward equipment rack furnished Jet Propulsion Laboratory (JPL) by LMSD was unsatisfactory and would have to be returned to LMSD for modification. This resulted in delays in obtaining preliminary information regarding the Ranger spacecraft operating techniques.

On 6 Oct 1960 a meeting was held at LMSD during which the first over-all program status report was given. At this time it was announced that the engineering releases for the NASA Agena B second stage booster were behind schedule and it was anticipated that final assembly completion date scheduled for 5 Dec 1960 would slip to 27 Dec 1960. However, the launch date was not endangered by this slippage.

On 18 Oct 1960 a contract with Fisback and Moore was approved for converting the Polaris Static Test Stand at SCTB for static testing the Agena B boosters.

During November 1960 a Board of Inquiry composed of Air Force and NASA members was conducted to determine the capability of LMSD to meet the NASA Agena B schedules. A copy of the report, which is complete in itself, is attached.

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As of 31 Dec 1960 engineering has been completed for the Ranger configuration of the Agena B booster and preliminary studies are being made in support of the Nimbus and Top Side Sounder (S-27) missions.

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Milestones

The following milestones were accomplished during the period 1 Jul 1960 to 31 Dec 1960:

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Program	Date	Milestone
Atlas Agena B Vehicle #1	8 Sep 60	Program Requirements Document (PRD) sent to AFBMD.
Atlas Agena B Vehicle #1	1 Dec 60	Agena Hangar - BOD.
Atlas Agena B Vehcile #1	22 Dec 60	Agena modification (Mod) engineering completed.
Atlas Agena B Vehicle #1	27 Dec 60	Agena final assembly completed.
Atlas Agena B Vehicle #2	8 Sep 60	PRD sent to AFBMD.
Atlas Agena B Vehicle #2	22 Dec 60	Agena Mod engineering completed.
Atlas Agena B Vehicle #3	31 Aug 60	Spacecraft interface specifications to LMSD.
Atlas Agena B Vehicle #3	22 Dec 60	Agena Mod engineering completed.
Atlas Agena B Vehicle #4	17 Oct 60	Spacecraft interface specifications to LMSD.
Atlas Agena B Vehicle #5	31 Aug 60	Spacecraft interface specifications to LMSD.
Atlas Agena B Vehicle #7	31 Aug 60	Spacecraft interface specifications to LMSD.
Agena Atlantic Missile Range (AMR) Facilities & Support	19 Aug 60	Pad 12 design criteria released.
Agena AMR Facilities & Support	19 Aug 60	Award Pad 12 A&E contract.
Agena AMR Facilities & Support	25 Nov 60	Pad 12 design - final approval.
Agena AMR Facilities & Support	22 Dec 60	Begin Agena GSE delivery to range.

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